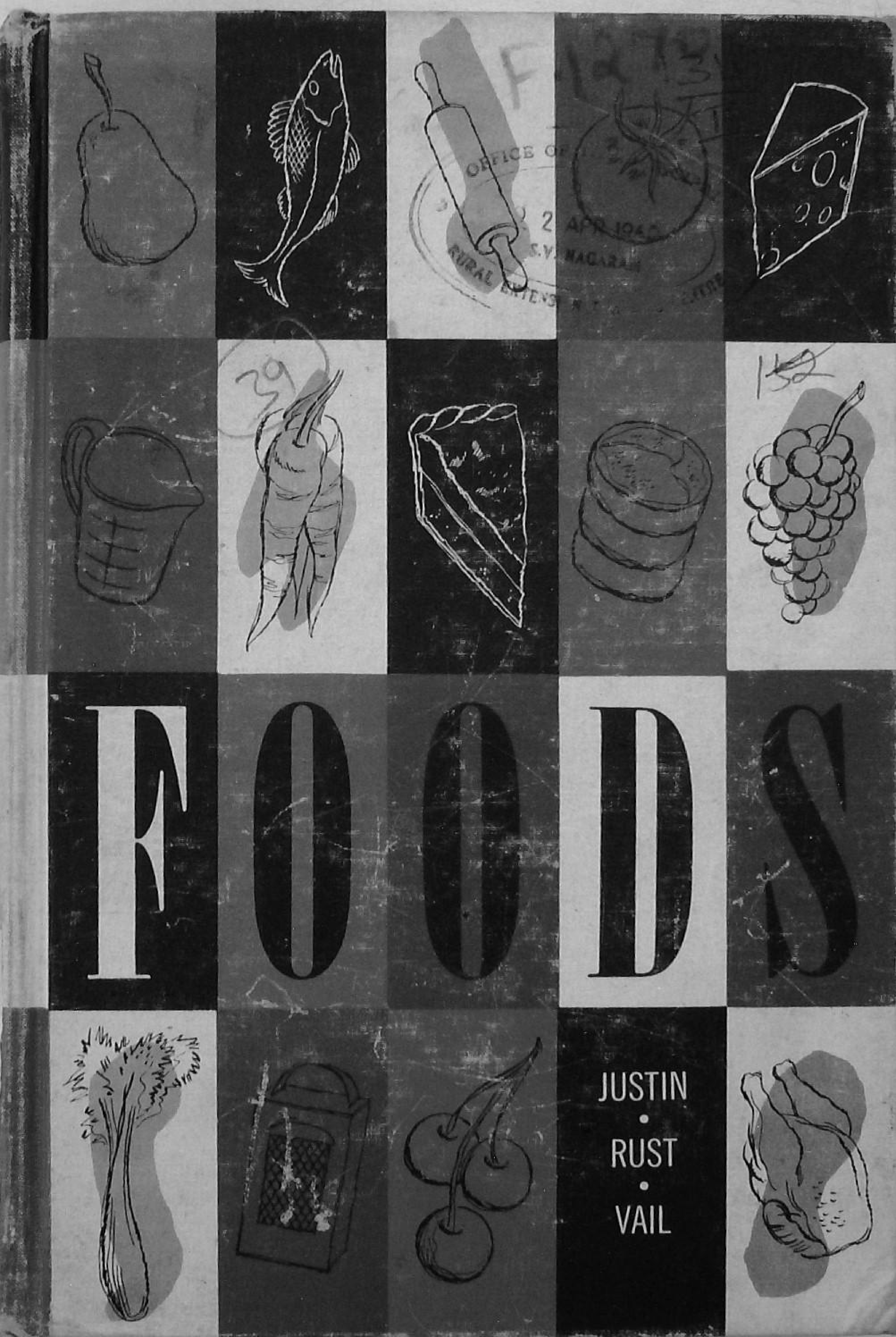
FOODS
JUSTIN
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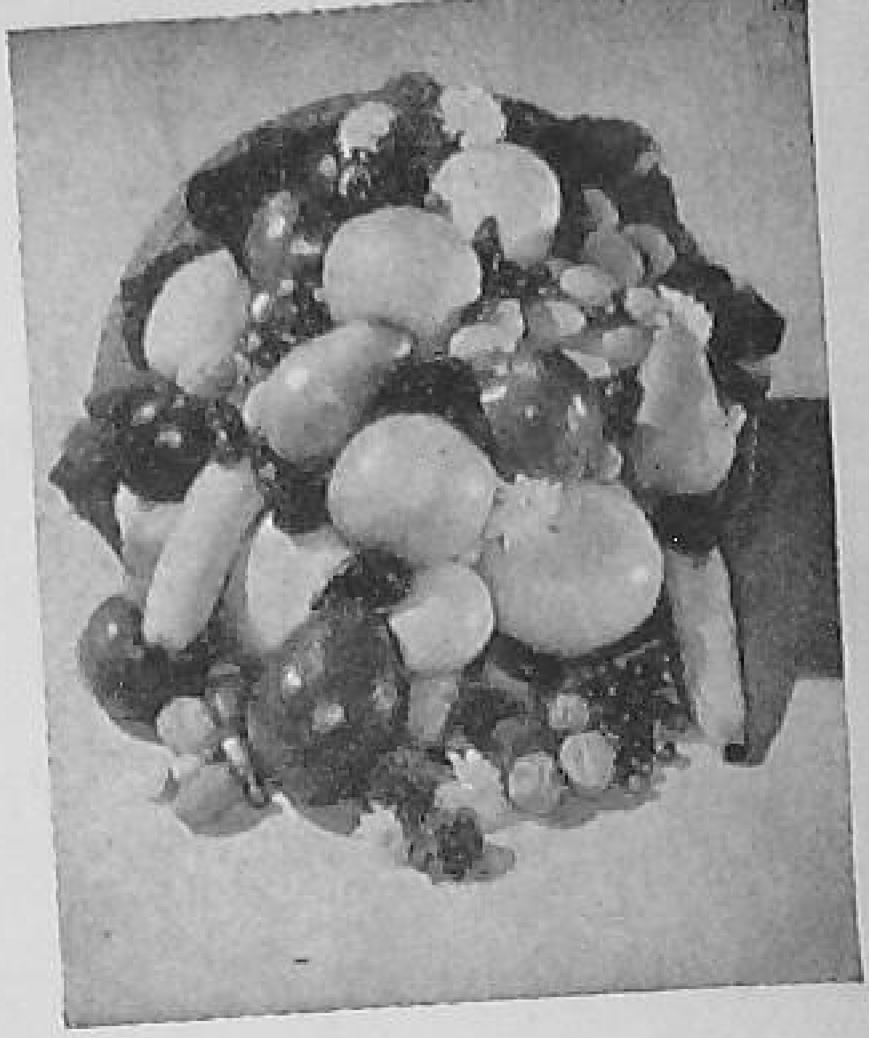
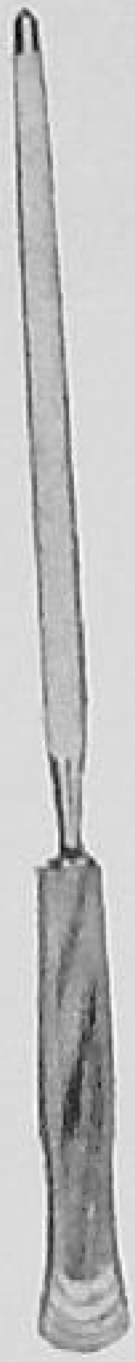
Home Economics

SERIES

EDITED BY *Alice F. Blood, Ph.D.*

FORMERLY DIRECTOR OF THE SCHOOL OF HOME ECONOMICS
AND PROFESSOR OF NUTRITION · SIMMONS COLLEGE





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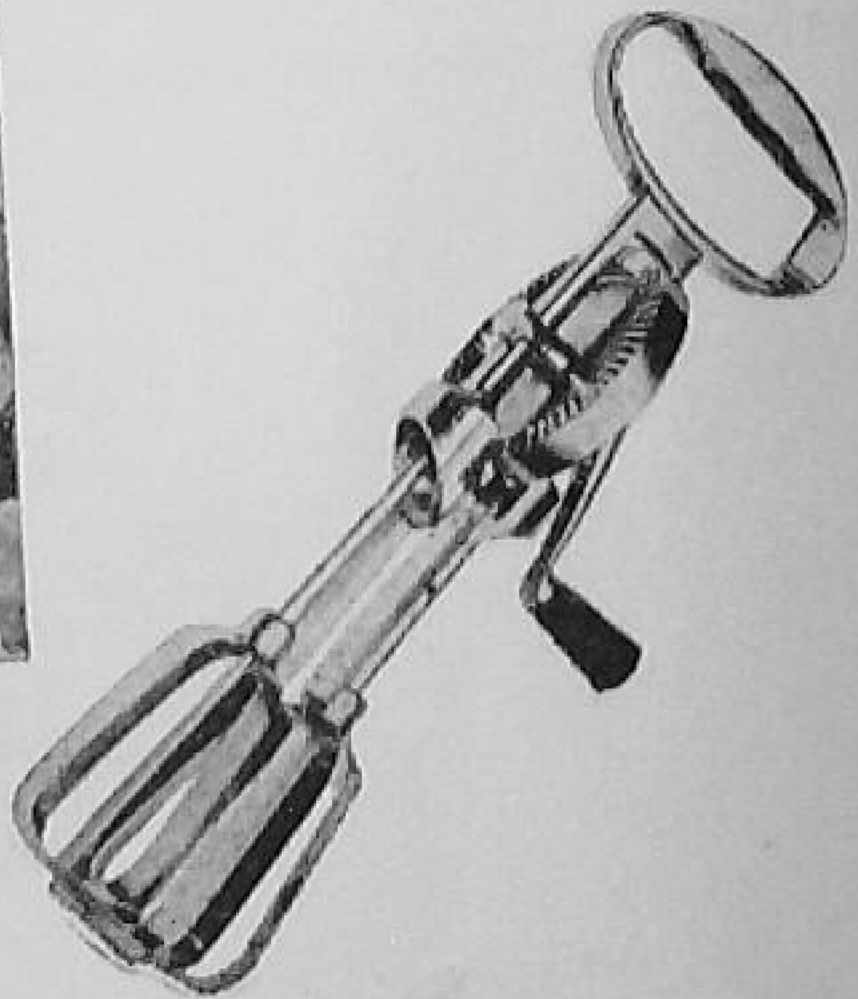

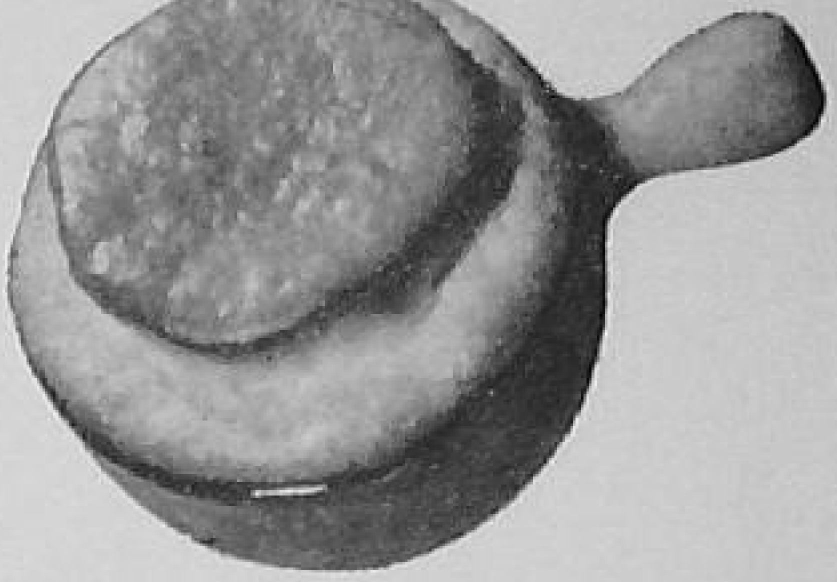

An Introductory College Course

MARGARET M. JUSTIN · LUCILE OSBORN RUST · *Kansas State College*

GLADYS E. VAIL · *Purdue University*

HOUGHTON MIFFLIN COMPANY ·

BOSTON · The Riverside Press Cambridge

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CAMBRIDGE MASSACHUSETTS
PRINTED IN THE U.S.A.

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Preface

DURING the past twenty-five years there has been a deepened interest in the effectiveness of college teaching in various subject matter areas. This is reflected in the former organization and presentation of college courses in detailed topical outlines which give assurance only that comprehensive coverage of the subject matter field had been at least attempted not that increased understanding had resulted. Such instruction has been subject to drastic criticism because of its misplaced emphasis on subject matter rather than students, and on scope of coverage rather than on effective learning experiences. A shift in this situation was noted in the first edition of *Foods*, which presented a new organization of subject matter known as the unit, problem plan. Today the focus of college teaching is increasingly shifting from being subject-matter centered to being student centered.

The statement of student needs which a course is planned to meet is expressed in terms of changes held by instructors and students as *desirable*. These provide the basis for the formulation of the student centered objectives for the course.

The objectives of the introductory foods course for which this book is planned to serve as a text are listed below in two categories:

I. Those objectives which this course shares with one or more other courses included in the college curriculum:

1. To develop the ability to make sound interpretations from an experiment and to distinguish among conclusions that can and can not be safely drawn from the data; those that are contradicted by these data; and any such unacceptable interpretation as false analogies and appeals to authority.
2. To develop skill in recognizing the relevance of subject matter studied and in applying it in the solution of one or more related problems.
3. To increase written and oral communication skills.

II. Those objectives which are specific for this course and the subject matter area from which it is derived:

1. To develop an interest in and an understanding and appreciation of the nutritive value of foods.

2. To develop an understanding of the wise expenditure of the food dollar.
3. To have a working knowledge of principles relating to food preparation.
4. To develop an understanding of the principles of sanitation as these apply to the work centers and procedures used in food preparation and clean-up.
5. To establish desirable standards for meals prepared and served in the home.
6. To appreciate attractive meal service.
7. To develop managerial skills in planning, preparing and serving adequate and attractive meals for the day.
8. To develop interest in selection, arrangement, care, and efficient use of the kitchen and its equipment.
9. To develop interest in selection, care and use of silver, glassware and china and other necessary accessories.
10. To understand and appreciate social amenities as a force in our civilization.

The organization of the book is devised to facilitate effective learning experiences. Laboratory activity is planned so as to provide for extension of the student's understanding and for establishing a close relationship to other class activities. The activities suggested are directed toward heightening student interest and deepening student understanding in this subject matter area. The problems under which the subject matter is organized are those which will aid the student in obtaining an understanding of this area of subject matter. Obviously the teacher can supplement the list with additional problems or omit some of those suggested, expanding or contracting those listed as desired. At the end of each unit will be found selected references. These may be used as a list of supplementary reading. Suggestions for evaluation have not been extensive as methods and instruments for this vary with the objectives selected by the instructor.

This text has been planned for a college course of six semester hours or the equivalent. By omission of selected units, the work covered may be reduced to that of a course of three semester hours' credit. It is our hope that the subject matter included will provide fundamental knowledge and increase understanding of foods by the student who may not carry the study further, and that others will find herein an adequate foundation for continued study.

Recipes and related material are not included as their place seems to be

in a cook book or a laboratory manual rather than in a college text. *The Basic Cook Book* by Heseltine and Dow (Houghton Mifflin Company) and *Practical Cookery* by the Department of Food Economics and Nutrition, Kansas State College (John Wiley and Sons), will be found excellent supplements to this book.

General acknowledgment is given the authors of standard works in fields of Food and Nutrition from which we have gleaned liberally in the revision of the text. The authors express their deep indebtedness to these and all those who have given suggestions, criticisms, permissions, and other help in the preparation of this and earlier editions of the book and to those of our professional colleagues who, by their enthusiastic acceptance of our efforts, have encouraged us to undertake the arduous task of a thorough revision at this time.

Margaret M. Justin
Lucile Osborn Rust
Gladys E. Vail

Manhattan, Kansas
West Lafayette, Indiana

Unit One

UNIT ONE

The Design for

American Dairy Association

Good Nutrition

FOOD IS ESSENTIAL to the nutrition of any human being or any form of life. If food is wholly lacking, life fails; if the amount or kind of food is inadequate, growth is stopped, or at least stunted, and the capacity to work and endure is lost. If food is consumed in excess of body needs, the "fires of life" are choked by overstoking and one may commit that ultimate folly described as "digging one's grave with one's teeth."

In the days when our forefathers were hunters, and lived on the meat from the kill, their design for good nutrition was relatively simple. The hunter stalked his quarry over miles of rough country, and when success crowned his efforts, he ate and then slept. The hazards of the hunt were such that most hunters had frequent involuntary fast days interspersed among the days of gorging. Hunger was the only sauce needed to give him zest for his meals. The only nutritional problems he or his family recognized were the total lack of food or its inadequacy in quantity or kind.

With the passage of time, the improvement of weapons and agricultural practices led to a more constant food supply. Eventually eating and drinking were accepted as among the chief pleasures of the rich, and people began to be aware of the destructive force of excessive food consumption. We are told that Diogenes, "meeting a young man who was going to a feast, took him up in the street and carried him home as one who was running into imminent danger, had he not prevented him." [1]

Awareness of the problems man created for himself when he gained partial mastery of his food supply are reflected in the writings of many lands. From the East comes this grim reminder. It is written in the Annals of Ardeshir Babekan that he asked a physician how much food

[1] Joseph Addison, *The Spectator*, October 13, 1711.

ought to be taken daily. The answer was, "The weight of one hundred dirrhems were enough." The king asked, "What strength will this quantity give me?" To which the reply was made, "This quantity will carry thee, but whatever more is taken, thou will be the carrier of it."[1] The gist of the incident is summarized as "Eat to live, thy prayers repeating, Think not life was made for eating."

Luigi Cornaro, the aged Italian author of *The Art of Living Long*, cites two proverbs sustaining this idea: "Whosoever wishes to eat *much*, must eat little," and "The food from which a man *abstains*, after he has eaten heartily, is of more benefit to him than that which he has eaten."[2]

In something of the same spirit Benjamin Franklin comments, "Against diseases known, the strongest fence is the defensive virtue, Abstinence." These observations are significant in indicating how man in many lands through many centuries came to distrust appetite as the sole guide to the nutritional needs of the human body and to seek to establish a less fickle directive to good nutrition. Only with the growth of modern science did it become possible to ascertain more exactly what food does for the body and how it does it. This vivid description of the steps by which we came to understand *the elements* in the *design of good nutrition* has been given by a former leader in the field:

> By patient steps, through Lavoisier's brilliant insight into the relation between the intake of oxygen into the body in respiration, the output of carbon dioxide from the lungs and the evolution of heat and work in the body; Liebig's study of the composition of foods and body materials; Rubner's accurate researches establishing definite relationship between food consumption and body activity; Eijkmann's demonstration that a specific disease may be produced by one diet and cured by another; Hopkins's brilliant conception of subtle elements in food regulating nutritional processes; Osborne and Mendel's control of growth through changes in the quality of a single chemical component of the dietary; McCollum's finding that old age may be deferred through a well-assorted diet; and Sherman's demonstration that a good diet can be made better by simple changes in natural foods, as shown by more rapid development of the young and greater vigor and a longer "prime of life" in adults — through the work of these and other able investigators we have come to the realization that nutrition is a science; that foods can be reduced to rather simple terms, and that the amount required by a man for a day's work can be determined with amazing accuracy.[3]

[1] Rose Garden of Sa'di.

[2] Cornaro, Luigi, *The Art of Living Long, with Essays by Joseph Addison, Lord Bacon, and Sir William Temple.*

[3] Mary Swartz Rose, *Feeding the Family*, pages 4–5. The Macmillan Company, 1940.

The dictum that fitness increases one's chances of winning laurels in the game of life is now generally accepted. Fitness includes the state of one's mental equipment and one's personality. To a marked extent these are pervaded and colored by the state of one's physical fitness, which in turn rests on one's health and nutrition. The interaction between physical and mental conditions is known to any college student who has attempted to take an examination when ill with a cold or a headache, or who has experienced lassitude or emotional instability following the omission of breakfast for several days.

Few persons have a clear idea of the advantageous influence of good health, because they accept as "good" a physical condition that is merely sufficient to permit the individual to work. Most people have never established an accurate criterion of health. Lack of conscious health standards was shown in an investigation made some years ago in which 5000 persons who did not consider themselves ill were given medical examination. The findings were: no defects, 0.0 per cent; minor defects, 0.1 per cent; moderate defects requiring minor attention 15.9 per cent; moderate defects requiring medical supervision, 25.0 per cent; advanced physical ailments, 51.0 per cent; serious defects requiring immediate attention, 8.0 per cent. It was significant that more than 50 per cent of those studied were suffering from advanced physical ailments, yet believed themselves well. Selective Service in the United States has further emphasized this fact in respect to young men called for military service. Often those who fail to pass the tests are unaware of their actual state of health and are even surprised when they learn of their condition.

The social need for adequate knowledge regarding accepted standards of physical fitness, and for the stimulation of interest in attaining such standards is highly evident. Nutrition is most important in attaining fitness. No list would be complete that failed to give due recognition to this aspect of health. In common use, the term nutrition has two meanings. In one, it refers to a bodily condition that is often called the state of nutrition, sometimes designated as nutriture; in the other, it means furnishing the body with adequate nourishment for growth, maintenance, and repair. In each case the basic factors involved are the food intake and its utilization by the body. These vary among groups of people and individuals.

PROBLEM 1 *What are the indications of good nutrition?*

Many people assume that their nutrition is good if they are able to take food into the body with a relative freedom from digestive disturbances; if from the food taken, they obtain energy to meet, after a fashion, the routine tasks of the day; and if their weight and body contour are in accord with those of persons of their own age in their family or community. The error in such an assumption is apparent when the accepted indications of good nutrition are considered. The indications are both subjective and objective. The nutritional state, for example, is indicated as definitely by the cheerfulness of one's attitude toward life as by freedom from susceptibility to colds or by the efficiency of the digestive organs. The indices of nutrition are found not merely in connection with man's food habits, but also in his physical and mental condition and in his general habits of living.

Physical signs of good nutrition

The person whose nutrition is good presents an appearance of good health. His weight is in good proportion to his height, age, and build. He is alert, vigorous, and active. His skin is clear, smooth, soft, slightly moist, and somewhat pink; often there is a marked color of pink in the cheeks. The hair is plentiful and lustrous, not brittle or extremely dry. The eyes are bright and clear with no dark circles or rings under them, and the mucous membranes are pink and free from inflammation. The fingernails and lips are decidedly pink, and the tongue is red, uncoated, and moist. The fat beneath the skin is firm and plentiful so that it cannot be raised in deep thin folds between the fingers. The muscles are firm and strong; their development is good throughout the body. The chest is broad and deep, with an expansion of not less than two and one half inches. The bones of the arms and legs are straight and well developed, with no enlargement of the joints. The teeth are clean and free from cavities, well formed, and enameled. The breath is sweet, the posture indicates vigor, the nervous system is stable, and the entire body functions properly.

Courtesy of Western Growers Association

Fig. 1

Good nutrition and good health go hand-in-hand. Both are readily noted in this young woman.

Weight and nutrition

Weight is a significant indication of the state of nutrition. Although weight is important, it should not be considered alone but in relation to the other signs of the nutritional state. Standard tables for weight usually show its relation to height and age or its relation to height, age, and body build. The latter standards are being used increasingly because they indicate more accurately a person's nutrition.

People may be classed according to body build into as many as five or seven classes. For most purposes, however, three are sufficient: the tall-slender, the short-stocky or heavy, and the average. The tall-slender type has less fat and a lighter skeleton than the others. The trunk is relatively long and narrow, the limbs are slender, and the feet and hands thin and tapering. The short-stocky type is built on heavier lines. The muscles are larger, the fat is firm and greater in quantity, the shoulders broad and square, with the skeleton proportionally larger than in the other types. As a whole, the body is broad and relatively short. The average type is between the slender and the stocky. Standards for each of these types have been arrived at through a large number of measurements.

By means of a few simple adjustments or computations, most people can find a satisfactory standard in one of these three groups. A tall person who has a broad, heavy frame may take as his average weight 5 or 10 per cent more than the given average for a tall, slender person of his height and age; and a short person who has a small, light frame may take for his average weight 4 or 5 per cent less than the given average for a short, stocky person of his height and age. Using the new average in either case as a basis, he then computes the limits of his weight zone.

Minor deviations from the standard do not, of course, always mean a low quality of nutrition. Correct body weight should never be thought of as a precise number of pounds. It should be considered as a zone, of which the upper limit, or overweight line, is the average weight plus 15 per cent; and the lower limit, or underweight line, is the average weight minus 7 per cent. Some authorities place the underweight line at 10 per cent below the average weight. Table 1 shows that girls five feet five inches tall and sixteen years of age will have an average weight of 123 pounds. As the theoretically correct weight for this height falls between 114 and 141 pounds, a girl would not be underweight unless she weighed less than 114 pounds, or overweight unless she weighed more than 141 pounds.

Being either markedly underweight or overweight may bring health

TABLE 1. HEIGHT, WEIGHT, AND BODY BUILD CHART FOR WOMEN*

Tall Slender Type					Average Type					Short Stocky Type				
Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.
	21	147	169	137										
	20	147	169	137										
70	19	146	168	136	70					70				
	18	146	168	136										
	17	145	166	135										
	16	144	165	134										
	21	144	165	134										
	20	144	165	134										
69	19	142	163	132	69					69				
	18	142	163	132										
	17	140	161	130										
	16	138	158	128										
	21	141	162	131										
	20	140	161	130										
68	19	139	159	129	68					68				
	18	138	158	128										
	17	138	158	128										
	16	136	156	126										
	21	136	156	126										
	20	135	155	126										
67	19	135	155	126	67					67				

* Adapted from the tables of Baldwin, Wood, Symond, and Stecher.

TABLE 1. (continued)

Height in.	Age yrs.	Average lb.	Over wt. 15 % Above Ave. lb.	Under wt. 7% Below Ave. lb.
	18	135	155	126
	17	133	152	124
	16	133	152	124
	21	132	151	123
	20	132	151	123
66	19	131	150	122
	18	130	149	121
	17	129	148	120
	16	128	147	119
65				
64				

Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb
66				
	21	129	148	120
	20	128	147	119
65	19	127	146	118
	18	126	144	117
	17	125	143	116
	16	123	141	114
	21	125	143	116
	20	124	142	115
64	19	123	141	114
	18	123	141	114
	17	122	140	113
	16	120	138	112
	21	122	140	113
	20	121	139	113

Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.
66				
65				
64				

TABLE 1. (continued)

Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.
63					63	19	121	139	113	63				
						18	120	138	112					
						17	119	136	112					
						16	117	134	109					
											21	118	135	110
											20	118	135	110
62					62					62	19	118	135	110
											18	118	135	110
											17	117	134	109
											16	115	132	108
											21	116	133	108
											20	116	133	108
61					61					61	19	116	133	108
											18	116	133	108
											17	113	129	105
											16	112	128	104

TABLE 1. (continued)

Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.	Height in.	Age yrs.	Average lb.	Over wt. 15% Above Ave. lb.	Under wt. 7% Below Ave. lb.
											21	114	131	106
											20	113	129	105
60					60					60	19	112	128	104
											18	111	127	103
											17	109	125	101
											16	108	124	100
											21	113	129	105
											20	112	128	104
59					59					59	19	111	127	103
											18	109	122	101
											17	106	121	99
											16	103	118	96

hazards so it is desirable for the weight to be within the "normal zone." Underweight tends to be much more prevalent in persons under thirty and excessive weight in those over forty, though exceptions frequently occur. Underweight people tend to be nervous, high strung, easily fatigued, and lacking in resistance to disease. The incidence of diabetes and diseases of the heart, circulatory system, and kidneys has been found to be higher in overweight people than in those of normal weight. In general, persons in their teens and early twenties should keep their weight nearer the upper than the lower limit of their weight zone; those past twenty-five should keep theirs nearer the lower limit.

Posture and nutrition

Posture, the position in which the body is held, whether standing, sitting, lying, playing, or carrying on the regular duties of the daily job, is another indication of nutrition. Posture is important both physically and mentally. Good posture is the position that is best adapted for work or rest and that requires the least expenditure of energy. For the body to function properly it must be held correctly. Otherwise the organs may be crowded or misplaced, and nutrition and health in general may be impaired. The person who carries himself erect and in the proper manner is usually self-confident and poised, with an air of assurance that commands respect and confidence from others.

In correct standing posture, the weight of the body is balanced equally upon the ball and outer side of the foot, with the large toes pointing forward, and the feet parallel and far enough apart to give a comfortable base for support. The abdomen is held in flat and back of a line extending down from the front of the chest. The hips are level and drawn back slightly without protruding. The shoulder blades are held flat across the back and the tip of the shoulder is in line with the ear. The head is held erect, the chin in, and the shoulders level. The chin is parallel with the floor and slightly behind a line dropped from the forehead. The chest is raised but not puffed out, and the arms hang easily at the side. The knees are straight but not stiff. The position of the body is such that if a plumb line were dropped from the ear, it would pass through the middle of the shoulder, hip, knee, and ankle.

The correct position of the body in walking is generally the same as in standing. The feet should point straight ahead, with the knees brushing each other and the big toes just missing each other. The leading should be done with the knees. The weight of the body should be carried on the outer edge of the feet. The body should be inclined forward slightly,

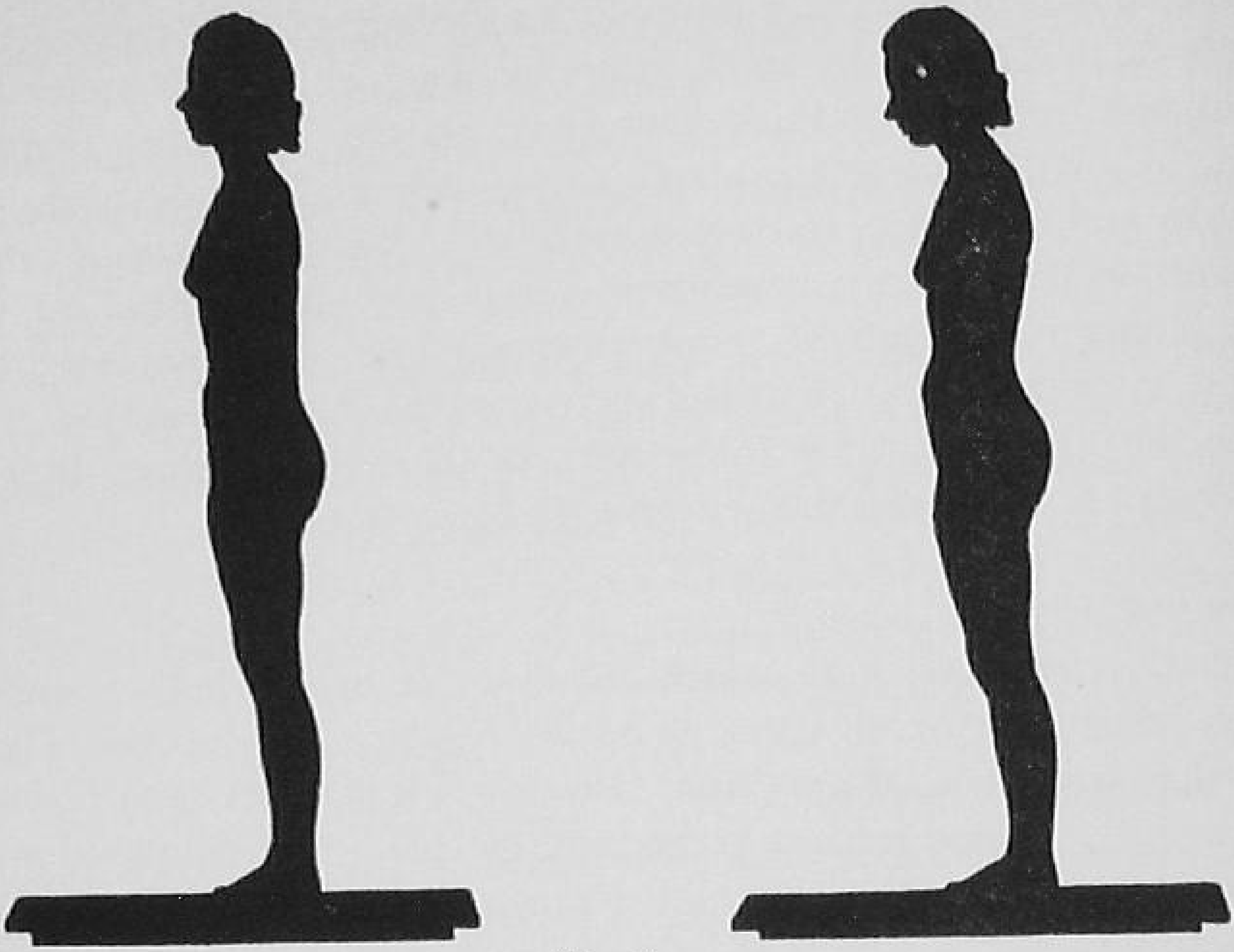


Fig. 2

A *B*

Correct posture (*A*) in standing holds the body in the most comfortable and attractive position. Incorrect posture (*B*) in standing, if long continued, will be harmful in many ways.

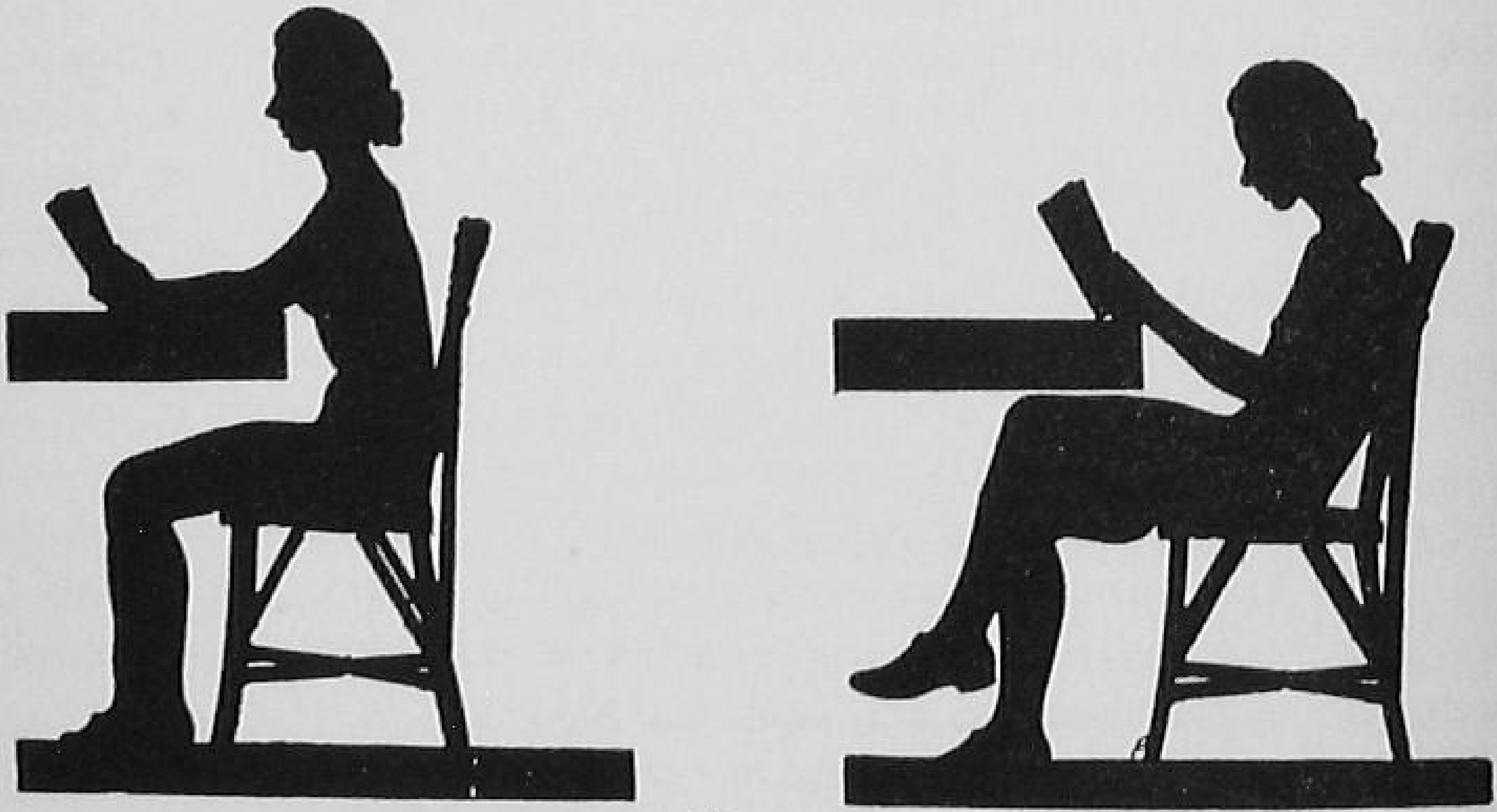


Fig. 3

A *B*

Sitting posture, too, is important. A comparison of correct (*A*) and incorrect (*B*) ways of sitting easily shows why the former position is the one to use.

with the arms swinging easily at the sides. The heels should touch the ground first, with the accent forward and upward.

In correct sitting posture, the trunk of the body is kept straight, and any inclination comes from the hips. The pelvis carries the weight. As in standing, the inter-clavicular hollow is just under the chin. When one sits at ease, as when sewing, listening to lectures, or attending the theater, the lower and upper back should both be against the chair. When one studies at a desk, the lower back should be against the chair with the arms on the desk for minor support. The shoulders should be kept back, down, and relaxed; the back straight; the chest up; and the abdomen in. One foot should be forward and one back.

In lying down, the proper position for the body is lying on the right side or partially on the face.

Other indications of nutrition

The appetite also gives evidence regarding the nutritional condition, a good appetite being considered a favorable indication. Food of the proper quality and quantity should be desired at regular intervals, anticipated with pleasure, and eaten with relish and enjoyment. A lack of desire for food or a feeling of revulsion or disgust at its sight is not normal and may indicate faulty nutrition. Normally, the desire for food is related to the amount and kind of food eaten. The continued absence from the diet of foods rich in certain vitamins is accompanied by a decrease in appetite that, as a rule, results in a general deficiency of food intake.

Although a good appetite is not an absolute necessity for the utilization of food, it may be an important aid in obtaining ready and complete digestion, which is essential to efficient utilization. The lack of a proper appetite is a great hindrance to satisfactory nutrition. The underweight person may have difficulty in increasing his weight because his limited appetite controls his consumption.

Nutrition is reflected by the general attitude of a person toward work and play and, indeed, toward life itself. The malnourished child may be either nervous, peevish, and highly irritable, or may show great lassitude. These characteristics together with the state of nutrition often carry over into adult life. The moroseness of the dyspeptic is proverbial, as opposed to the cheerfulness, if not hilarity, of the well-nourished food-lover. "Let me have men about me that are fat," is Shakespeare's expression of the relation between cheer and the state of nutrition.

Zest for work or active play is best sustained by energy easily avail-

able for such endeavor. Nutrition that is so poor that energy is insufficient for the daily activities will not usually be accompanied by an enthusiastic zest for either work or play. The feeling of adequacy that accompanies good nutrition should give an incentive toward intensive and sustained endeavor. In these and in other ways the nutritional state is reflected in the quality of living.

Any marked deviation from the indications of good nutrition should be considered serious enough for consultation with a physician. He has other means of judging nutrition than those cited. He can tell by the composition, condition, and pressure of the blood; the activity and condition of various glands controlling the building and tearing down of tissues; the condition of the lungs; the susceptibility to various infections; and the analyses of urine and feces. This information can be obtained only through careful examination and expert diagnosis. The fact that many nutritional difficulties can be overcome if discovered early, shows the importance of the yearly check-up by a physician.

ACTIVITIES

1. Working in groups, determine class members whose weight is in the correct weight zone, those who are underweight and overweight, and those whose weight is exactly average for their correct weight zone. How do these groups compare in numbers?
2. Maureen Davis, a college sophomore, is 19 years old, 67 inches tall, and weighs 140 pounds. She read in a magazine that the desirable weight for motion picture stars of her height is 120 pounds. She decides that she is greatly overweight and must go on a reducing diet. How do you evaluate her decisions? What advice would you give her in regard to the matter?
3. Class make a score sheet for judging a person's nutrition.
   (*a*) Use this to judge your own nutrition and that of your partner. Compare scores.
   (*b*) What indications of good nutrition occur most frequently? Of poor nutrition?
   (*c*) Under what conditions would you advise special checking by a physician?
4. Working in groups, test each other's standing, sitting and walking postures. Make a summary of the findings and recommendations for each member.
5. Using the following form for each day, begin to keep a record of your food intake for the next seven days.

DIETARY RECORD

Name____________________ Date____________ Day________

Place eaten:

Breakfast__________ Dinner / Lunch__________ Supper / Dinner__________

Food	Ingredients	Estimated Measure	Cups of Water
Breakfast			
Between Meals			
Lunch or Dinner			
Between Meals			
Dinner or Supper			
Between Meals			

PROBLEM 2 *What may affect a person's nutrition?*

The factors which affect the nutritional state often seem obscure. Some few fortunate persons, wholly unaware of the how or why of the matter, may be in good nutrition. Others, less fortunate and more numerous, are in poor nutrition and are seeking relief from its limitations rather than an explanation of the cause of their condition. Though the relation of cause and effect may not be apparent to the members of either group, careful study will reveal certain factors that have determined the state of nutrition. Most of these lend themselves to study and to evaluation.

Body functions

A human body whose organs are functioning properly is essential to good nutrition. An efficient digestive system is important in the adequate utilization of food by the body. Faulty digestion and attendant malnutrition may be caused by an abnormal condition in any part, whether in the stomach, liver, pancreas, or intestines.

The circulatory and respiratory systems influence the nutritional state. The blood carries the food and oxygen to the cells and also carries away waste. If, for any reason, the heart is weakened or the blood loses its power of carrying oxygen or food, nutrition is impaired. The blood receives its oxygen supply through the lungs. If this supply is limited by faulty respiration due to diseased lungs or other causes, the nutritional state is lowered by the incomplete utilization of the food. Poisons produced in diseased tissues also may cause further impairment.

Nutrition may be affected adversely by poor elimination of body wastes through the excretory organs, chiefly the intestines, lungs, skin, and kidneys. For example, constipation, which is a state of poor intestinal elimination, may cause lack of appetite, lassitude, headache, fatigue, and nervous tension. None of these conditions is conducive to good nutrition.

Certain glands, known as endocrine or ductless glands, that pour their secretions directly into the blood and lymph streams, have a definite effect upon the body's utilization of food. The most important of these are the thyroid, parathyroid, pituitary, and adrenal glands, and the

pancreas. If any one of these glands becomes impaired and its secretion changed in character or amount, nutrition suffers. For example, oversecretion of the thyroid gland has a marked quickening effect upon all body processes, especially those of the circulatory and respiratory systems; the demand for food and oxygen thereby is greatly increased. Undersecretion of this gland has the opposite effect; the body processes are slowed down, and the person appears lethargic and lazy. The thyroid is often said to be to the human body what the draft is to the fire.

Mental health

Worry, emotional instability, and a nervous condition may be causes of digestive disturbances and poor utilization of food, resulting in an underweight condition. Such emotions as fear, irritation, anger, and hatred may depress the appetite, slow up the digestive processes, and even stop them entirely for a time. Regurgitation often follows emotional upsets. Cases of poor nutrition in both children and adults have been traced to environmental conflicts. Such conflicts may be either between personalities in a situation or between an individual and his situation. The malnourished child who is unable to eat because of bickering between his parents, and the underweight college freshman who is unable to eat because of homesickness, are common examples. The nutritional condition may be greatly influenced by a person's attitude toward certain foods or toward foods in general. An established adverse attitude toward milk may exclude this valuable food from the diet; a lack of interest in food may lead to a low intake.

Remediable defects

Certain remediable defects often found in teeth, tonsils, and adenoids affect the state of nutrition. One of these defects in teeth is faulty occlusion. If the upper and lower teeth oppose each other perfectly in the act of biting, there is good occlusion. If there is irregularity in the bite, the faulty occlusion prevents proper mastication. Another defect in teeth is that of serving as foci of infection. There is abundant scientific evidence showing a relationship between infected teeth and impaired health. In many instances, concurrent malnutrition is noted. Both faulty occlusion and infection in teeth can be remedied by expert treatment and care.

Tonsils, lymphoid tissues located on either side of the opening from the mouth into the pharynx, and adenoids, lymphoid tissues located in the nasopharynx, are normal parts of the human body. Like all lymph-

oid tissue they serve as guards against bacteria. But their location favors infection too gross for them to control. Hence both tonsils and adenoids may become permanent foci of infection. Nutrition may be affected both directly by the poisons that pass from the diseased tonsils to the stomach, and indirectly by the impairment of body functions such as circulation and respiration. Adenoids are more often enlarged than infected. The effects of enlarged adenoids include, among others, malnutrition, anemia, underdevelopment, predisposition to common colds, and increased susceptibility to infectious diseases. Diseased tonsils and adenoids are serious handicaps that may be overcome only by removal. Such salutary effects as a marked decrease in colds, an increase in weight, and an improvement in the nervous system are commonly attendant upon such measures.

Health habits

Health habits have a significant influence in determining the nutritional state and in this food habits are of primary importance. Food habits include daily practices in regard to the kind, amount, and quality of food eaten, and the regularity with which it is taken. These habits for most people have become routine. They are largely determined by economic status, geographic location, family and local customs, age, activities, personal likes and dislikes and knowledge and understanding of nutrition. The family on a limited income must exercise care if good nutrition is to be maintained. The geographic location as well as the climatic conditions influence both the variety of foods readily available and certain needs of the human body. Within a community, even when cost need not be a consideration, family and local customs tend to limit the number of foods included in the daily diet. Likewise, within the family, the age and activities of the members and their personal likes and dislikes control still further dietary practices just as does what they know and understand about nutrition.

Other health habits are closely related to nutrition. Sufficient fresh air, sunshine, rest, exercise, and pure water, all commonly listed as essentials to good health, influence the body's nutritional state. Each desirable health habit aids the effectiveness of all other good habits in sustaining satisfactory nutrition.

Food fads and fallacies

Many erroneous ideas exist in regard to food some of which are of long standing while others are newly formed. Often these are followed to such

an extent that nutrition is greatly impaired. Few of the food fads and fallacies have any scientific basis, and careful scrutiny will soon reveal their falseness as well as their possible ill effects. Many of these notions regarding food are based upon personal prejudice and misinterpreted personal experiences. Others are mere superstition. Bad food habits may even be a cause. Advertising has far too often promoted and encouraged wrong ideas about food. Frequently by featuring half-truths and misusing scientific facts regarding foods, many people are led to adopt bad food practices. Though the list of such food fallacies is long, a few examples are:

Cucumbers should be soaked in salt water to draw out the poison in them.

Milk and a sour food should never be eaten at the same meal.

Meat and starchy vegetables should never be eaten at the same meal.

Carrots make the complexion clear.

Fish is a brain food.

Salt in food causes cancer.

Milk is fattening.

Vegetables should be cooked a long time to make them digestible.

Animal foods make people aggressive and warlike.

Drinking water with meals hinders or prevents digestion of the food.

Everyone should eat yeast and bran regularly and often.

Each of these food fallacies violates one or more recognized scientific facts of nutrition and may result in harm to those who accept the falsehood as truth.

The present craze for feminine slimness has brought many new fads in diets. In this class are the widely known "banana-milk," "grape juice," "fruit-nut," "lettuce-orange juice," "Hollywood," "eighteen" or "ten" day, and "green vegetable" diets. Though the foods included in these various diets are good in themselves, the diets are so inadequate that only harm can result if they are continued for long. Food selection based on food fads and fancies will act adversely upon nutrition.

Personal evaluation

Intelligent direction of one's efforts to improve nutrition is facilitated by an evaluation of the evidences of health and health habits. Plans for such procedure vary from the brief to the detailed.

A record that is no more than a brief inventory of certain health conditions and practices is often used. An example of this type is given in Table 2.

If the information from such a simple record is supplemented with essential facts learned from a physical examination, it will provide a basis for evaluating nutrition.

TABLE 2. HEALTH INVENTORY

Name..Age...........	
Weight...........Height...........Body Build...........................	
1. Do you sleep in bed 8 to 9 hours daily?	....
2. Do you drink 6 to 8 glasses of water daily?	....
3. Do you eat three wholesome meals daily?	....
4. Do you eat the following foods daily?	
Fruit?	....
Vegetables, including one raw?	....
An egg?	....
A pint to a quart of milk?	....
One whole-grain or enriched cereal?	....
One serving of meat, fish, or poultry?	....
5. Do you spend some time in outdoor exercise daily?	....
6. Do you have one or two hours daily free from regular work?	....
7. How often do you have colds?	....
8. How often do you have headaches?	....
9. Are you troubled with constipation?	....
10. How frequently do you take a laxative?	....
11. Have you had your teeth examined within the past six months?	....
12. Have you had a physical examination within the past year?	....

For a detailed health record, much more comprehensive and complete data should be obtained. Many of the items should be checked and the questions answered by a physician or under his supervision. Record forms for this purpose have been developed by various organizations and institutions for their own and others' use. Such a form is the one prepared by The American Dietetic Association for college students, dietetic majors, applying for internships in hospitals approved by this organization (Table 3).

Regardless of the type of health record form used, a recheck should be made at frequent intervals. This will indicate whether improvement is being made and what further changes in health practices are needed.

TABLE 3. PHYSICAL REPORT FOR DIETETIC INTERNS[1]

Applying for Admission to Internships Approved by The American Dietetic Association

Instruction: This complete report is to be sent by physician to the following faculty member:

Name — Date of birth
Address — Place of birth

FAMILY HISTORY
(May be filled out by student)

Father: Living Well Ill Ailment Cause of Death
Mother: Living Well Ill Ailment Cause of Death
What relative has or has had: Tuberculosis Diabetes
Mental Disorder Nervous Disorder

PERSONAL HISTORY
(May be filled out by student)

Check once (√) those you have had. Double check (√ √) those you now have.

Acne	Food allergies	Ovarian disorders
Appendicitis	Other allergies	Pleurisy
Asthma	Headaches, frequent	Pneumonia
Chickenpox	Heart ailments	Rheumatism
Chorea	Hay fever	Rheumatic fever
Colds, frequent	Hernia (rupture)	Scarlet fever
Constipation	Infantile paralysis	Sinusitis, chronic
Diabetes	Kidney disorders	Smallpox
Digestive disturbances	Jaundice	Sore throat, frequent
Diphtheria	Malaria	Tonsillitis
Discharging ear	Measles	Typhoid fever
Dysentery, amebic	Meningitis	Tuberculosis
Fatigue, easily	Mumps	Undulant fever
Epilepsy	Nervous breakdown	Whooping cough

List injuries and degree of recovery — Dates
List surgical operations and degree of recovery — Dates
List recent serious illnesses — Dates
Defects — Handicaps
Speech impediments
How many hours do you sleep? — Do you worry frequently?
Menstruation: Began Regular Irregular Normal Profuse
Days Pain None Slight Severe
Is it necessary to go to bed? How long?

REMARKS:
Signed
Student

PHYSICAL EXAMINATION
(To be filled out by physician

Weight Height Temperature General Nutrition
Vision: Without glasses R. L. With glasses R. L. Nose: Normal Obstruction
Disease of eyes

[1] Courtesy of The American Dietetic Association.

Ears: Normal R. L. Deafness R. L.
Tonsils: Normal Path Removed Tags
Skin: Clear Acne Face Back Slight Moderate Marked

Teeth: Good repair Cavities Gums: Irritated Normal
Mouth: Any disease Throat: Any disease
Spine: Normal Moderate Marked Kyphosis Lordosis Scoliosis
Posture: Good Fair Poor
Reflexes: Patella Romberg Pupillary

Thyroid: Normal
Enlarged Slight Moderate Marked
Toxicity: Yes No

Lungs: Normal Rales
Heart: Normal Murmur
Pulse: Regular Irregular Rate
Breasts: Normal Mass
Blood pressure

Abdomen: Normal Tender Mass Scar
Hernia: Yes No. R. L. Type
Hemorrhoids: Yes No

Feet: Normal Arches Low Moderate Marked
Pain Yes No
Mycosis: Yes No
Callouses Corns
Varicose Veins: None Slight Moderate Marked

LABORATORY FINDINGS:
Urine: Color Sp.Gr. Reaction Albumin Sugar
Hemoglobin Kahn or Wassermann Stool Examination
Tuberculin Test Date Chest Xray Date

IMMUNIZATIONS:
Typhoid Inoculation Mo. Yr. No.
Smallpox Vaccination Yr. Scar Reaction

REMARKS:
Do you recommend this student for training?
Physician's Signature Address Date

ACTIVITIES

1. Make a list of the organs and glands of the body whose proper functioning is essential to good nutrition. State how each affects a person's nutrition.
2. As a part of class discussion, give an example of a mental condition or attitude affecting a person's nutrition. Cite an instance in which a remediable defect was a contributing factor to a poor nutritional state. Select a health habit and show how it influences or does not influence nutrition.
3. Form into groups and discuss food fads and fallacies commonly accepted in the community, suggesting possible reasons for them. Each group report a summary of the discussion to the class.
4. Evaluate your health practices according to the suggested health inventory. Decide what practices should be continued and what ones changed or dropped.
5. Explain how a yearly physical examination is related to a person's nutritional state. If possible give illustrations from your own experience.

PROBLEM 3 *What food constituents are essential to good nutrition?*

The term "food" is commonly used to refer to those substances that form a part of the usual diet of a particular group of people. In this country, milk, eggs, tomatoes, and flour are accepted foods; in some other country, tomatoes may be excluded and birds' nests or locusts added. The exclusion of tomatoes from the food list of one country does not alter their dietary importance in another. Evidently a broader basis of definition than that of inclusion in any local dietary practice is essential. Scientifically speaking, foods are not so much substances that we eat as substances that supply certain nutrients when eaten. Foods, then, are defined as those substances which, when taken into the body, furnish energy, build and repair tissues, and regulate body processes. Foods as included in the diet are often complex substances, capable of meeting more than one of these body needs. One food may supply both energy and building material; another may regulate body processes and give energy. The contribution that a food makes to the body depends upon its constituent parts and the ability of the body to utilize them. The chief constituents of foods are classified in six groups: carbohydrates, proteins, fats, minerals, vitamins, and water.

The body's need for energy is met through carbohydrates, fats, and proteins. Its need for building and repairing tissues is primarily met by proteins and minerals, though these are supplemented by the other constituents. The regulation of body processes is commonly regarded as the particular function of water, proteins, vitamins, minerals, organic acids, and cellulose. Though water, proteins, carbohydrates, and fats make up the largest quantity of the food constituents used, the others listed are also essential.

Carbohydrates

Among the common carbohydrates are sugars and starches.[1] These are composed of the chemical elements carbon, hydrogen, and oxygen.

[1] The chemical formulae of certain carbohydrates follow: $C_6H_{12}O_6$, glucose; $C_{12}H_{22}O_{11}$, cane-sugar; $(C_6H_{10}O_5)_x$, starch.

The term "sugar" to most people means cane or beet sugar, which is sucrose. However, this is only the most common of the several sugars responsible for the characteristic sweet taste of certain foods. Milk, fruit, vegetables, corn syrup, and malt contain sugars other than sucrose. The different sugars in foods differ from each other, but all give the foods in which they are present a characteristic sweet taste.

Starch is a carbohydrate more complex in nature than any of the sugars. Like sugar, it is built by the combination of carbon, hydrogen, and oxygen. The production of sugar by the plant may be an intermediate step in the manufacture of starch. The ability of the plant to build starch and the ability of the animal body to utilize it were known long before some of the processes involved in its synthesis and utilization were known. The plant, by means of its chlorophyll, takes the carbon and oxygen from the air and, combining these with water brought through the roots from the soil, manufactures sugar. This sugar is dissolved in the sap or juice of the plant and carried to all its parts as food. When the plant produces more sugar than is required for its immediate need the surplus is stored for future use. Whether the place of storage is seed, root, leaf, or stem depends upon the plant. Usually the plant stores the carbohydrate as insoluble starch in the form of tiny grains or granules until need for food causes the starch to be changed back to sugar. In each kind of plant the granules differ in size, shape, and appearance. For example, the starch grains of rice are quite unlike those of corn, potato, or wheat. This difference is readily observed by means of a microscope. Some foods high in starch are potatoes, sweet potatoes, wheat flour, rice, dried peas, and beans.

Although carbohydrates are considered to be of vegetable origin, sugar is found in the blood streams of animals and of man. Provision is made in the cells of the liver for storage of animal starch (glycogen) sufficient to meet the requirements of the human body for carbohydrates for a comparatively short time. The animal body, like the plant body, synthesizes this more complex substance from sugar and later hydrolyzes it to sugar as needed.

Cellulose is also a carbohydrate, containing the elements present in starch in the same proportion. As the ability of the body to digest and assimilate cellulose is exceedingly limited, its use in the diet is not to supply energy but to give bulk and to provide material for certain regulatory processes such as the elimination of waste from the intestines. Foods high in cellulose are bran, dried fruits and legumes, fruits with skins, seedy fruits, and leafy and coarse-fibered vegetables.

The organic acids found in a large number of foods are frequently considered with carbohydrates. The utilization of organic acids in the body for energy is similar to that of starches and sugars. Organic acids also have a part in stimulating and regulating body processes. Fruits and vegetables are the best sources of organic acids. Citric and malic acids are examples of those commonly found in these foods.

Only a few foods consist of pure carbohydrate. Well-known examples of these are cane and beet sugars and cornstarch. A food is considered high or low in carbohydrate according to the amount it contains in proportion to its total solids. Foods high in carbohydrates are:

Bananas	Dried fruits
Cakes	Honey
Candy	Molasses
Cereals and cereal products	Potatoes
Cookies	Sugar
Doughnuts	Syrup

Proteins

Proteins differ from carbohydrates in that, besides the elements present in sugar and starches, they also contain nitrogen and in most cases sulfur. Phosphorus and iron are also found in some proteins. The importance of nitrogen is shown by the fact that proteins are often called nitrogenous foods. The nitrogen content commonly varies from 10 to 18 per cent. Proteins are found in foods of both animal and plant origin. Meat, fish, eggs, milk, legumes, nuts, and certain of the cereal foods are high in protein. All these foods contain more than one protein. Milk, for example, contains the proteins lactalbumin and casein, as well as others of lesser importance.

Proteins are complex in nature, being composed of a number of amino acids or "building blocks" linked together, and also of amino acids linked with other substances. Proteins vary in the kind and number of amino acids present. More than twenty amino acids have been isolated. Certain amino acids the body is unable to build. These are known as essential amino acids and must be supplied by the foods eaten. The adequacy of a protein, as a food, depends upon the presence of all the essential amino acids.

Variation in the quality of proteins has resulted in their classification as complete, partially complete, and incomplete, based upon their ability to support normal growth and to maintain life. A complete protein is

Courtesy of National Dairy Council

Fig. 4

All of these foods are rich in protein.

one that is adequate to support normal growth and to maintain life even if it is the only protein in the diet. A partially complete protein is one that maintains life but does not support normal growth. An incomplete protein, although valuable in the diet, will by itself neither support normal growth nor maintain life. Most animal proteins are complete. Plant proteins are more or less incomplete, although the soybean, the Brazil nut, and the wheat grain contain certain proteins that are complete. In a diet as varied as the American, the protein quality will be satisfactory if the quantity is adequate. The liberal use of milk, eggs, and other animal foods in the diet is an assurance that the protein is adequate. Valuable sources of protein are:

Cereals and cereal products	Legumes (dried)
Cheese	Meat
Eggs	Milk
Fish	Nuts
	Poultry

Fats are composed of carbon, hydrogen, and oxygen, but in different proportions than the carbohydrates. Though fats contain much more carbon and hydrogen and less oxygen, the relationship to carbohydrates is close. Fats are important energy producing foods but they have other functions too. They are carriers of certain of the vitamins, aids in prevention of constipation, and also sources of certain fatty acids that the body must have and can obtain in no other way. Fatty acids are component parts of all fats. Excessive consumption of either carbohydrates or fats may increase the amount of body fat, since the animal body is able to transform these foods, when taken in excess of energy needs, into fat that is stored in the body tissue.

Fats are of both animal and plant origin. Some of the common animal fats are butter, lard, tallow, and suet. Peanut oil, coco butter, cotton seed oil, and corn oil are among the common fats obtained from plants. A characteristic of all fats is their insolubility in water.

Fats are found throughout the animal body in muscle tissue, as protective tissue around the viscera and other organs, and as purely adipose tissue. Fats are slower to digest than the other food constituents, hence they have what is called a longer "staying power," which aids in preventing hunger. Fat combines with other food elements such as phosphates to produce fat-like substances usually found with true fats. Lechithin, present in egg yolk, is such a substance. Foods high in fat content are:

Avocado	Oleomargarine
Butter	Olive oil
Cream, thick	Peanut oil
Corn oil	Pork
Egg yolk	Salad oils and dressings
Lard	Suet
Nuts	

Minerals

In addition to the food elements already presented, the body needs certain elements known as mineral or ash constituents. The list is long, including calcium, chlorine, copper, iodine, iron, magnesium, manganese, phosphorus, potassium, sodium, sulfur, zinc, and possibly aluminum, cobalt, fluorine, nickel, molybdenum and silicon. Due to the very small amount required of each, the six last named minerals along with copper and zinc are usually referred to as trace elements. However, this in no way underestimates their importance in the body. Certain relationships prevail among these elements and food constituents that make unnecessary a study of the diet for adequacy of all the elements listed. For example, a diet adequate in protein also supplies sufficient sulfur, and one adequate in protein and calcium usually contains sufficient phosphorus. Common use of table salt insures the necessary chlorine and sodium; and the ordinary varied or mixed diet cares for the requirement for manganese and magnesium as well as many other minerals. Of the minerals needed by the body, calcium, phosphorus, iron, and iodine are most likely to be lacking in the usual diet. The adequacy of the diet, as far as minerals are concerned, depends largely on the inclusion of foods rich in calcium, phosphorus, iron, and iodine, and the availability for body use of these constituents in the foods.

Calcium is required for all tissues but especially for bones and teeth. It is essential in the coagulation of blood, the beating of the heart, the irritability of nerves, cell activity, and the maintenance of the neutrality of the body. Foods that are important sources of calcium are:

Beans (dried)	Molasses
Bread made with milk	Oysters
Carrots	Oranges
Cheese	Salmon
Egg yolk	Turnips
Figs (dried)	Vegetables, green and leafy except beet leaves, chard, and spinach
Ice cream	
Milk	

Courtesy of National Dairy Council

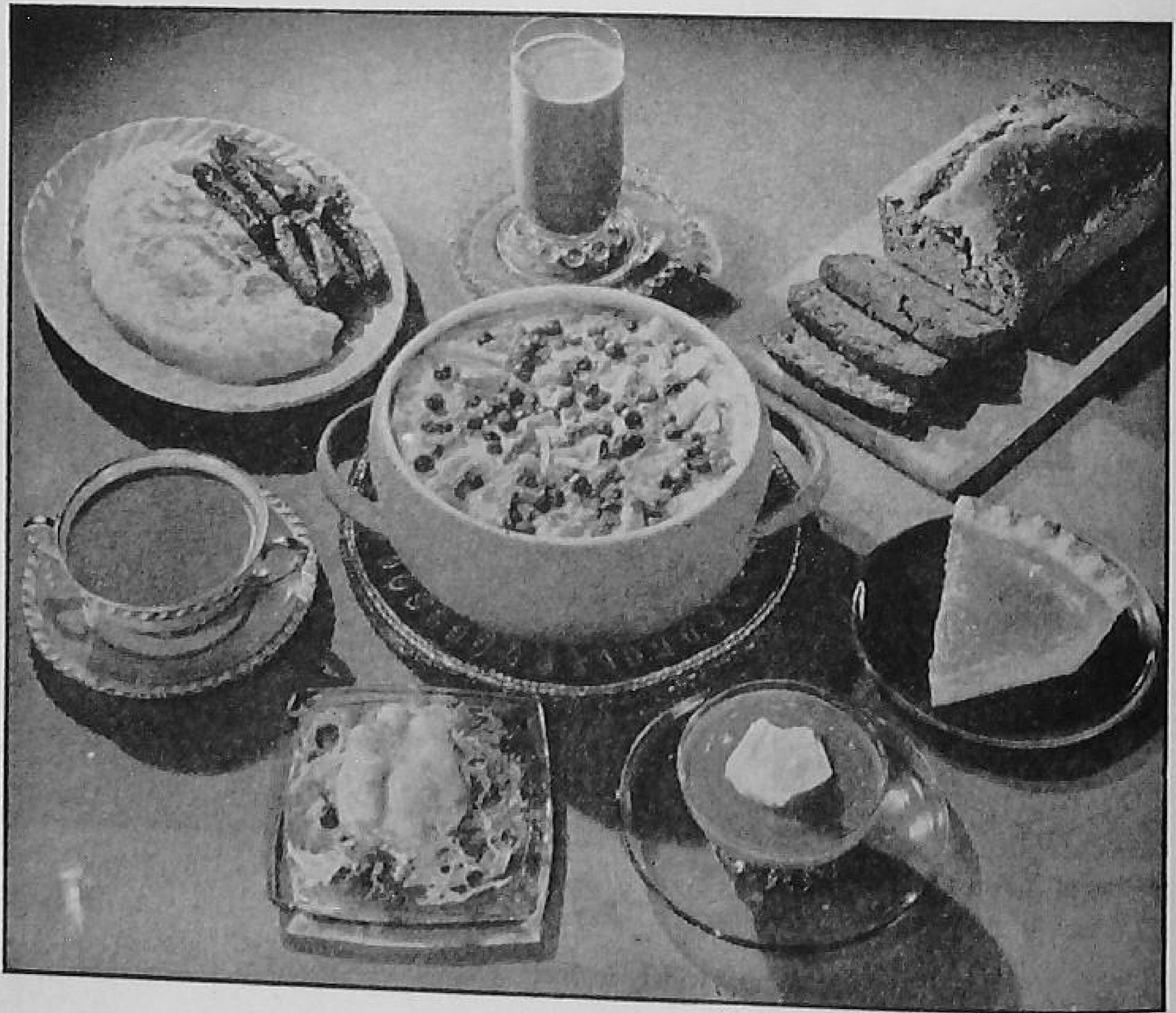
Fig. 5

Foods vary widely in their calcium content.

Though beet leaves, chard, rhubarb, and spinach are rich in calcium, their oxalic acid content makes for low utilization of this mineral by the body.

Phosphorus, too, is necessary in all tissues and is essential in the oxidation of carbohydrates. It helps in the regulation of the neutrality of the blood, in the conductivity of nerve impulses, and in the controlling of cell activity. Important sources of this food constituent are:

- Cheese
- Corn
- Egg yolk
- Fish
- Ice cream
- Leafy vegetables
- Lean meat
- Legumes
- Liver
- Milk
- Rolled Oats
- Shellfish
- Whole grains



Courtesy of Evaporated Milk Association

Fig. 6

Milk, one of the most important foods, is a basic ingredient in all of these foods.

An interesting relationship in respect to good sources exists among calcium, phosphorus and protein. Some foods that are good sources of calcium are likewise good sources of phosphorus. Also the proteins of fish, meat, and poultry are high in phosphorus but not in calcium. Milk and certain milk products, especially cheese, are the only foods that are excellent sources of both calcium and phosphorus.

Iron is necessary to form hemoglobin, a substance in the blood which carries oxygen to the cells and plays an essential role in body functions and the activity of cells. So important is iron in the diet that it is often added to flour, bread, and processed cereals to restore in part the iron lost in milling and manufacturing. Valuable food sources of iron are:

- Apricots (dried)
- Beef
- Bread and cereals
  - enriched
  - whole grain
- Broccoli
- Dates
- Egg yolk
- Fish
- Greens
  - (collard, dandelion, mustard, turnip)
- Legumes
- Liver
- Molasses
- Potatoes
- Prunes, dried
- Raisins
- Shellfish

Foods in which the iron is highly available for body use are egg yolk, enriched bread and cereals, dried apricots, figs and prunes, liver, molasses, potatoes, and raisins.

Even though the normal diet is most unlikely to be deficient in copper, this constituent is highly important in nutrition and its functions in the body are closely related to those of iron. Copper has a specific function in the body's use of iron for hemoglobin production without entering into the structure of hemoglobin. Copper also aids in certain activities of body cells and tissues. Copper is widely distributed in foods and most of those that are good sources of iron are also good sources of copper.

Iodine is an important constituent of thyroxin, which is required for physical and mental growth and development. It is found chiefly in the thyroid gland and in the blood. Simple goiter is recognized as a disease caused by a deficiency of iodine in the body. Iodine aids in the regulation of general health and of the nervous system. When iodine is lacking in the diet, the thyroid gland is unable to produce thyroxin, a hormone which controls the metabolic rate and which is necessary for all the oxidative reactions of the body. For some time iodine has been added to

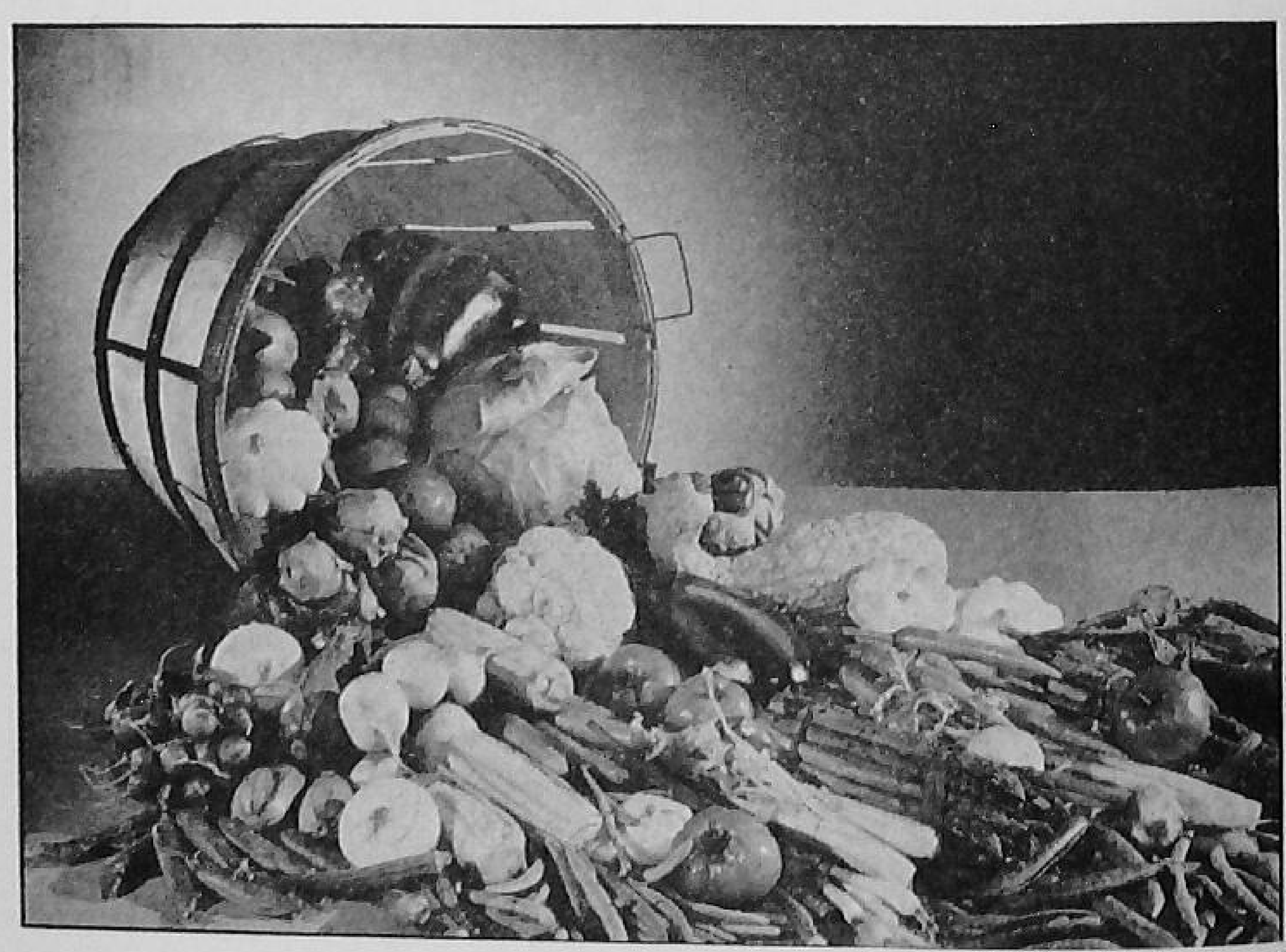
table salt (sodium chloride) in an amount equal to that lost in its refining. The resultant product is known as iodized salt, and its use is considered the best way to insure that the body obtains the needed iodine. About half the salt sold now is so enriched. Sources of iodine are:

Cod liver oil
Fish (salt water)
Iodized salt
Sea foods
Vegetables, cereals, dairy products, and fruits produced on soils of good iodine content
Water supply

The iodine content of vegetables, cereals, dairy products, fruits, and water varies greatly with the locality in which these are produced. In some places iodides are added to the water in order to meet the need for iodine.

Vitamins

The food constituents known as vitamins are exceedingly important



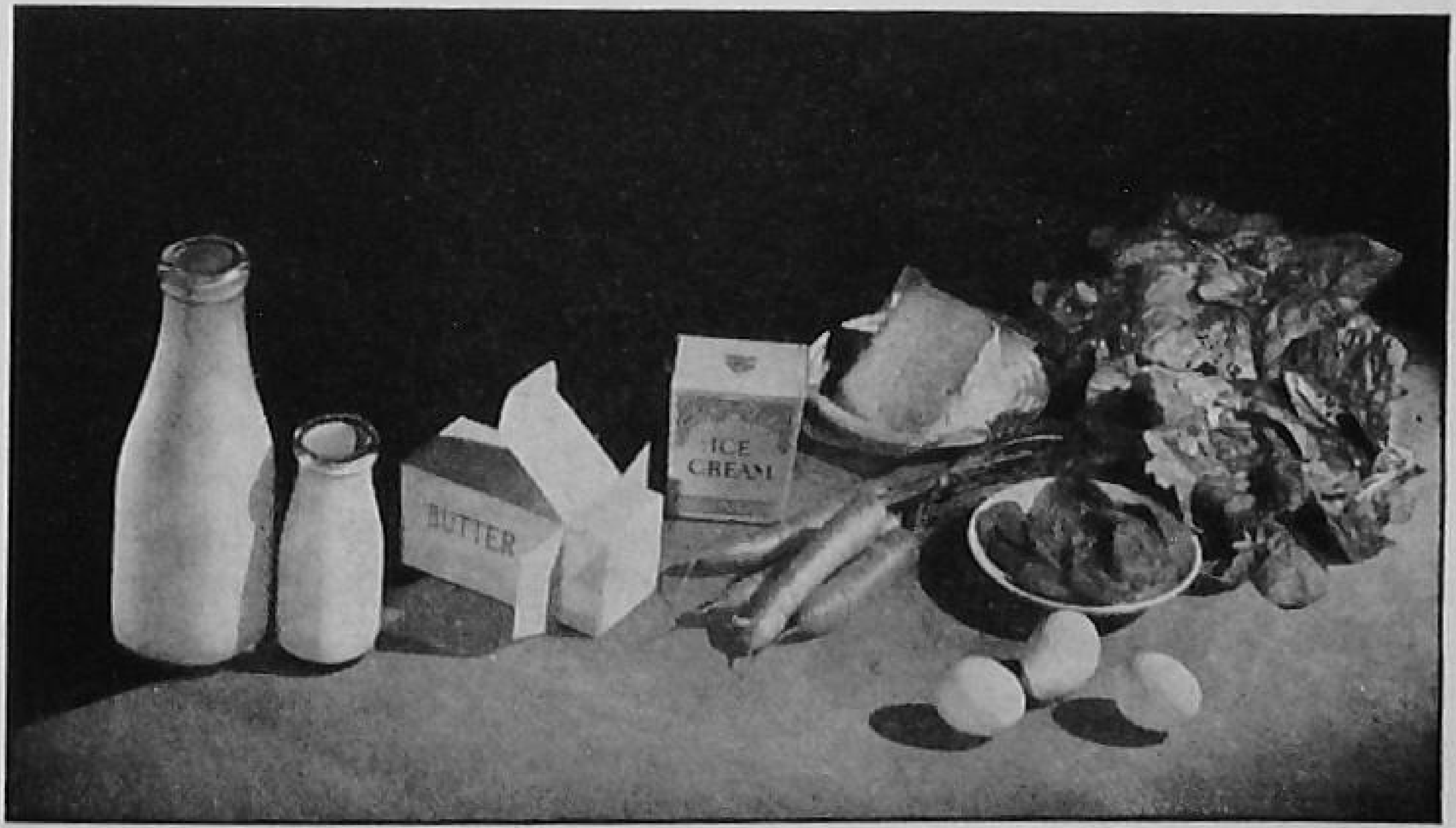
Courtesy of National Dairy Council

Fig. 7

Vegetables contain many essential food constituents. Their increasing use should be followed and encouraged.

in nutrition even though they are required only in small or minute amounts. Vitamins are essential for optimum nutrition and health and for normal growth and development. They serve the body in many ways, for instance, by promoting growth, by regulating body processes, by protecting against disease, and as conservers of that general expression of well-being sometimes termed "the possession of the attributes of youth." In minimum quantities they may cause growth to continue and may protect against certain diseases connected with inadequate nutrition. In larger quantities, which may be several times the amount required for mere protection, they may contribute to an optimum state of nutrition that further safeguards health and enriches living. Furthermore, adequate amounts of vitamins are necessary for the optimum utilization of all other food nutrients. Those vitamins that are generally recognized as essential, and some of those that may be essential, are considered here. Though many vitamins are available in the form of concentrates, in pure synthetic preparations, or both, foods still remain the best source of these important substances.

Vitamin A was first discovered in butter, egg yolk, cod liver oil and green vegetables. Its supply in liberal quantities is essential to good



Courtesy of National Dairy Council

Fig. 8

Foods rich in Vitamin A include a number of the commonly used fats, many green and yellow vegetables, and certain high-colored fruits. Liver, too, is a valuable source of this vitamin.

nutrition and vigorous health in the adult as well as in the child. It stimulates growth and aids in general well-being. It affords protection against the eye diseases, xerophthalmia and night blindness, defective enamel in teeth, low resistance to infection, retarded growth, and loss of reproductive power. Vitamin A occurs as such in animal foods. It occurs in certain vegetables as carotene or provitamin A, a bright yellow pigment, which the body changes to vitamin A. This vitamin is stable to heat and, since it is a fat-soluble substance, does not dissolve to any appreciable extent in water. But it is not stable to light, especially ultraviolet light. Vitamin A may be added to foods. The outstanding example of such addition is in oleomargarine. In itself this food contains little or no vitamin A, but practically all now manufactured is fortified with this vitamin. Foods which are rich in vitamin A are:

Butter
Cheese (made from whole milk)
Cream
Eggs
Fish oils
Fortified margarine
Fruits — high-colored
(apricots
prunes
yellow peaches)

Liver
Milk (whole)
Vegetables — green and yellow
(green peppers
lettuce
spinach and other greens
carrots
sweet potatoes
yellow corn
yellow squash)

Vitamin D, the antirachitic or "sunshine" vitamin, is really "stored sunshine" in food. This storage is made possible by the presence of ergosterol, a fat-like substance in food, which is called a provitamin because it can be transformed into a vitamin. Sunshine itself is an excellent means of providing vitamin D. The skin contains provitamin D, and under direct exposure to the sun or to ultraviolet light for short daily periods, this substance is converted into vitamin D within the body. Unlike most of the other vitamins, this one is not easily destroyed and is stable to heat, alkalis, acids, and oxidation. Vitamin D is essential for the development and maintenance of bones and teeth. Growing children require larger amounts of this vitamin than adults do. Unfortunately, vitamin D is rather meagerly distributed in nature, and its sources in our natural foods are very few. But a number of foods, especially yeast, contain ergosterol which can be irradiated by ultraviolet light and thus transformed into vitamin D. This concentrated product is used to

fortify milk, margarine, and other foods with this vitamin. Sources of vitamin D are:

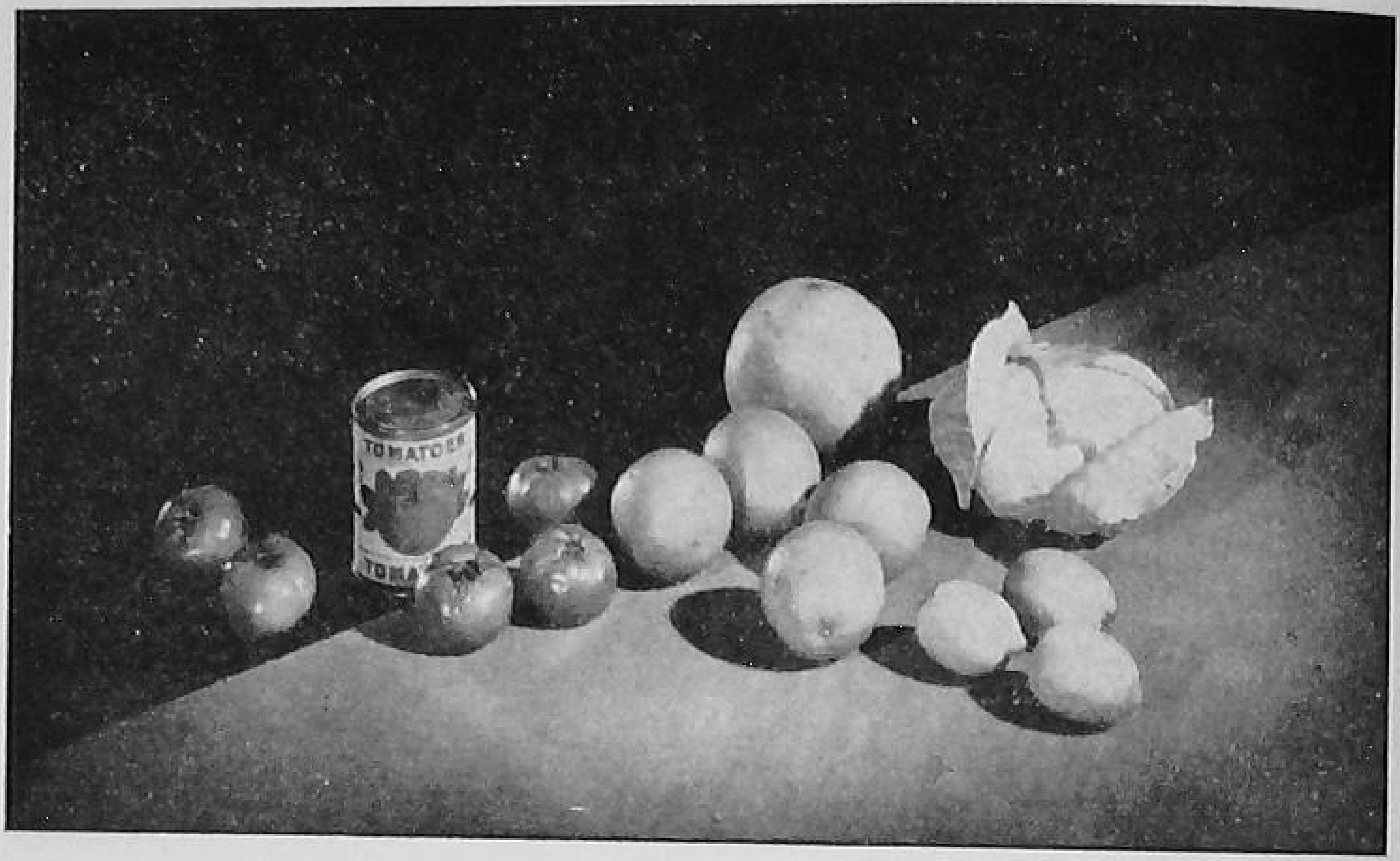
Butter and egg yolk	Vitamin D milk, other irradiated foods, and those fortified with vitamin D
Fish liver oils (*e.g.* cod and halibut)	
Oily fish	

Vitamin E affects reproduction and fertility, growth, muscle tone, and the condition of the nervous systems of certain animals. It also has a function in preventing the destruction of other foods through oxidation. However, the extent to which vitamin E is necessary to human beings has not been fully determined. Because it is present in many widely used foods, planning a diet without sufficient supply of this vitamin is almost impossible. Heat does not easily destroy it, but ultraviolet light does. Since it is fat-soluble, water does not dissolve it, but it is easily oxidized. The best sources of vitamin E are the plant oils — coconut, corn, cottonseed, peanut and especially wheat-germ — butter, eggs, green leaves and liver.

Vitamin K is necessary for normal clotting of the blood, which is most important in preventing hemorrhages or excessive bleeding. There appears to be enough vitamin K in the normal diet for ordinary needs. However, in special situations or conditions such as childbirth and surgery, for example, additional amounts of this vitamin are frequently given. Heat has little effect upon vitamin K and, like the other fat-soluble vitamins, it is not soluble in water. Alkalies, strong acids and sunlight destroy this vitamin and even light from an ordinary electric light bulb has a weakening effect. Foods rich in vitamin K are:

Cabbage	Liver (hog's)
Cauliflower	Spinach
Kale	

Ascorbic acid, known also as vitamin C, prevents and cures scurvy and hence is often termed the antiscorbutic vitamin. But ascorbic acid has other functions, which include maintaining the strength of capillaries, promoting the healing of wounds and protecting the body in times of illness and stress. Prolonged lack of this vitamin causes bleeding gums, loose teeth, sore joints, loss of appetite and weight, and fatigue, and in extreme cases, scurvy. As the body does not store this vitamin, an ample daily supply is essential. Ascorbic acid is the least stable of all the vitamins. It oxidizes readily, and in the presence of heat, alkali, and oxygen,



Courtesy of National Dairy Council

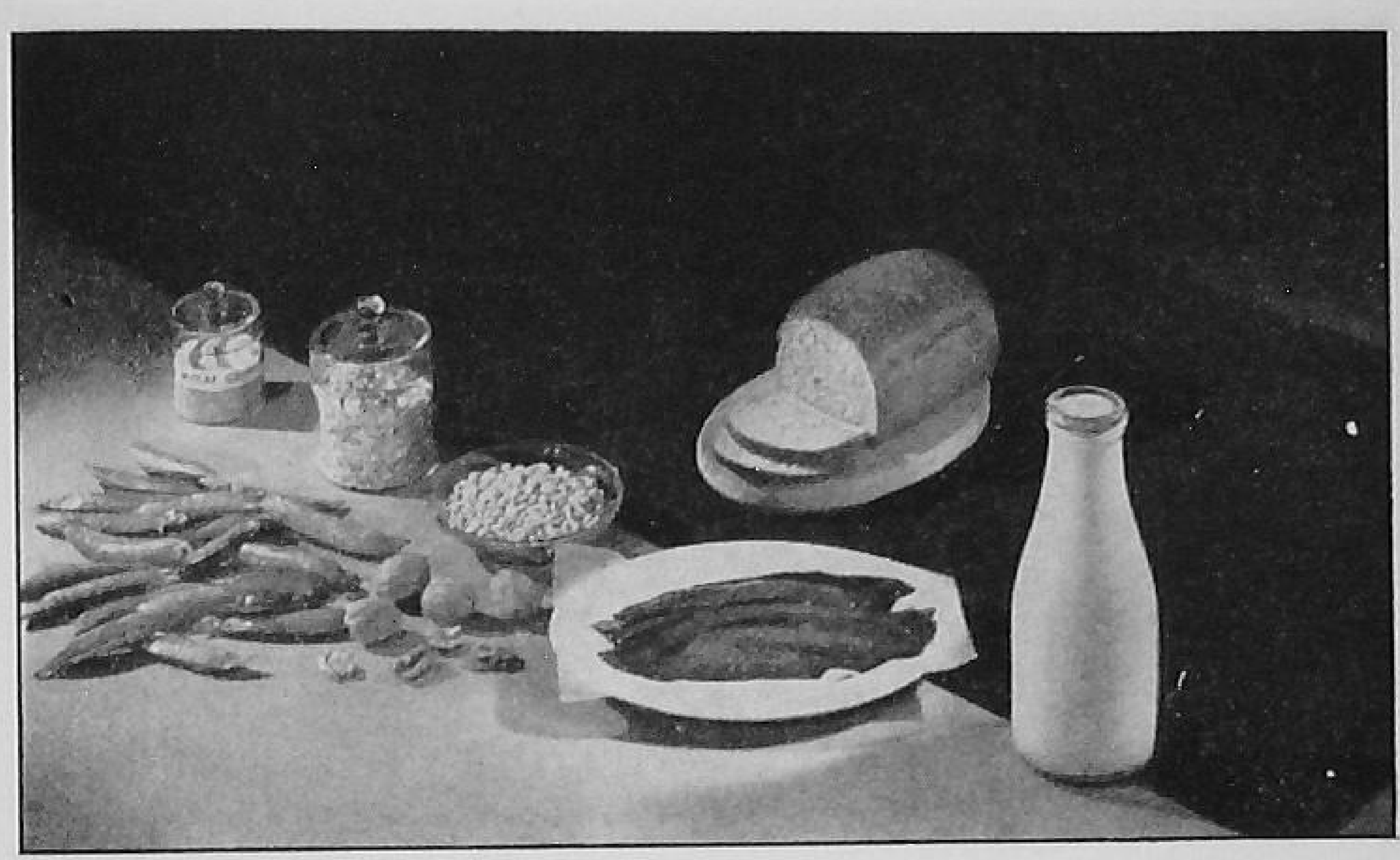
Fig. 9

Ascorbic acid is found in all living plant cells and especially in the growing parts of the higher plants. Certain ones are richer sources than others. Animal cells, on the whole, contain only small amounts.

oxidation goes on rapidly. Ascorbic acid is water-soluble and hence may be lost in cooking. The best sources of this vitamin include:

Cantaloupe	Vegetables
Citrus fruits	(green, leafy, and especially those of the cabbage family)
Peppers	
Strawberries	
Tomatoes	

Thiamine which is sometimes designated as B_1, is one of the B vitamins that are often called the B-complex vitamins. It is appetite-promoting and aids in the digestion and assimilation of food. It is also necessary for growth and reproduction. A protective against the disease beriberi, thiamine is quite as important in the general well-being of the body as in protecting against damage to the nervous tissues. Loss of appetite, listlessness, sluggish digestive system, and nervous irritability result from a continued low intake of this vitamin. Beriberi results from a complete lack of it. Thiamine is not readily destroyed by ordinary cooking processes, but is by prolonged heating. Alkalies, such as baking soda, increase the loss. Since this vitamin is water-soluble, much of it is dissipated in the



Courtesy of National Dairy Council

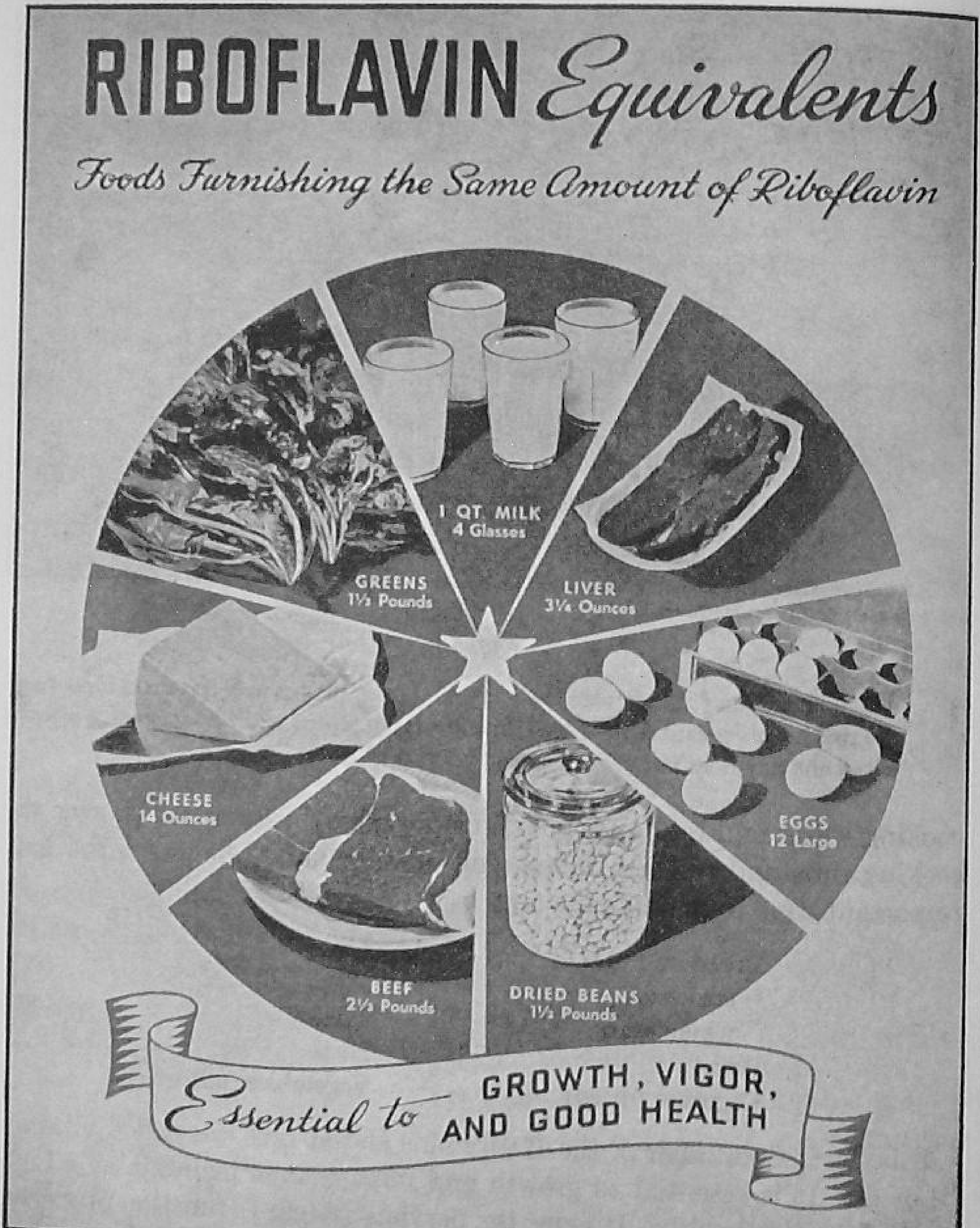
Fig. 10

Thiamine is found in both plant and animal tissues, though only certain of these foods are rich in this constituent. Since thiamine is not stored in the body, a large amount eaten one day does not provide a supply upon which to draw.

cooking water and lost when this is discarded. However, the shorter the cooking time and the less the amount of water used, the less is the loss. Important sources of thiamine are:

Bread and cereals	Liver
enriched	Meat (all)
whole grain	Milk
Heart	Nuts
Legumes (dried)	Vegetables (all)

Riboflavin is another of the B vitamins and at first was called vitamin B_2 or G. It is essential to growth and important in maintaining a high level of positive health. It helps the nervous system to function properly, and is necessary for reproduction and lactation. Riboflavin has an important relationship to sight, in that the cornea and retina both make use of it. A deficiency in riboflavin results in sores on the lips, reddening and scaling of the skin about the ears, mouth, and nose, and in some cases, retarded growth, loss of hair, and nutritional cataract. Riboflavin is little affected by heat but is easily destroyed by baking soda. It is also readily destroyed by light. Being water-soluble some of this vitamin is



Courtesy of National Dairy Council

Fig. 11

Some good sources of riboflavin.

likely to be lost in the cooking of vegetables and especially when the water from them is not used. Foods that are good sources of riboflavin are:

Bread and cereals	Green leafy
enriched	vegetables
whole grain	Lean meat
Cheese	Legumes
Eggs	Liver
Milk	

Still another of the B vitamins is niacin. Long before it was recognized as a vitamin, this substance was known to chemists as nicotinic acid. Niacin is essential for growth and for the normal functioning of the skin and the digestive tract. It also prevents pellagra, the first symptoms of which are general weakness and loss of appetite and weight, though in the later stages, extreme cases develop sore mouth, digestive and nervous disturbances, and skin eruptions. Niacin is stable to air, heat and light. However, it is readily soluble in water and especially hot water so is subject to loss in cooking. Foods that furnish generous amounts of niacin are:

Bread and cereals	Lean meat
enriched	Liver
whole grain	Peanut butter
Legumes	Poultry

In many states thiamine, riboflavin, niacin, and iron are more and more commonly being added to flour, bread, rice, corn meal and other processed cereals to enrich them with these needed food constituents. Such enrichment is indicated upon the label of packaged foods.

Pyroxidine, often referred to as vitamin B_6, is essential for good health. It is especially involved in certain cellular activities and in the utilization of other foods by the body. Prolonged lack of this vitamin results in abdominal pain, extreme nervousness, insomnia, irritability, weakness and sometimes difficulty in walking. Since it is widely distributed in both plants and animals, people whose diets are otherwise adequate are rarely lacking in pyroxidine. This vitamin is soluble in water and stable to heat, alkalies and acids. However, it oxidizes readily and is destroyed by light. Good food sources are heart, liver, meat, seeds, and whole wheat.

Pantothenic acid, also of the vitamin B group, is of great importance in many body processes and is necessary for good nutrition. It appears to be closely associated with other B-vitamins in utilization of foods by the body. Marked deficiency of this vitamin in human beings results in

burning hands and feet. However, pantothenic acid is found in many of the commonly eaten foods so deficiencies are not often observed in people. Among the best food sources are liver, meats, milk, and whole grain cereals. Lesser amounts are in eggs, vegetables, and molasses.

Folic acid, or folacin, has an important place in the list of B vitamins, being necessary for cellular growth. It has an active role in the prevention and treatment of certain types of anemia and accompanying disorders and is associated with various body processes and utilization of other foods. It is slightly soluble in water and is stable to heat but not to light and acids. Sources of this vitamin are fresh green and leafy vegetables, liver, kidney, eggs, milk, and whole grain cereals.

Biotin is essential for cellular functions and also helps the body in utilizing other nutrients. Like other B vitamins it is soluble in water. However, it is not affected by light nor is it easily destroyed by heat and acids. Strong alkalies, though, are destructive to this vitamin. Biotin is widely distributed in foods and a deficiency under normal conditions is unlikely. Foods that provide liberal supplies of biotin are eggs, fresh fruits and vegetables, liver and other organ meats, milk and sea foods.

Vitamin B_{12}, a recently crystallized vitamin of the B complex, is essential to the formation of red blood cells. It has been used effectively in the treatment of pernicious anemia and also in that of some of the other

Courtesy of National Dairy Council

Fig. 12

These foods are rich in the essential food constituents.

anemias. There is some evidence that this vitamin has growth promoting properties and participates with certain other foods in the carrying on of various body processes. Vitamin B_{12} is soluble in water and the solution, if neutral, is stable at room temperatures. However, in a slightly acid or alkaline solution its stability is lessened. Among the known food sources of this vitamin are liver, fresh muscle meats, kidney and milk powder.

Certain relationships among the vitamins make for better use of these nutrients in the body. For example, thiamin, riboflavin, and niacin are all essential in the utilization of carbohydrates. Vitamin B_6 is essential to the utilization of protein. Vitamin D is closely related to the metabolism of calcium and phosphorus and in its absence these minerals are not efficiently used in bone formation. Certain foods are rich in several of the necessary food constituents while others contribute only one or two. Thus certain protein-rich foods may also contribute thiamine, riboflavin, niacin and iron whereas certain desserts contribute little other than carbohydrate.

Many other vitamins than those presented here have been discovered. A number of these, choline and inositol, for example, are known to be of importance in animal nutrition but their role in that of people has not been determined. More investigation needs to be done before these and others can be added to the list of essentials in human nutrition.

Water

Water makes up approximately two thirds of the body's composition. It is present in every cell and tissue, and is important in regulating body processes. Digestion, assimilation, regulation of heat, and elimination of wastes are all dependent upon the water content of the body. Drinking water frequently contains some of the minerals needed by the body, such as calcium, iron, iodine, and sodium. The body's requirement for water is met through water consumed as such; through that taken in beverages and other fluid foods; and through that held in the composition of such foods as tomatoes and strawberries, which, though seemingly solid, really have a high water content. Most foods add some water to the day's total consumption. A further addition is made by the body in the process of the utilization of food.

Base-forming and acid-forming foods

Foods are sometimes classified as base-forming and acid-forming. These terms refer to their use in the body and not to their flavor or taste.

This classification is founded upon the residue or ash that remains in the body after the food is utilized. Certain foods leave a basic residue, sometimes called alkali, and others leave an acidic residue or acid. The body needs both types of foods, with the base-forming ones predominating slightly over the acid-forming ones. Base-forming foods are milk, nuts, fruits — except cranberries, plums, rhubarb, and prunes — and vegetables, especially white potatoes and legumes. Acid-forming foods are eggs, meat, fish, poultry, and cereal products, including corn. Apparently there is little need for concern in obtaining a proper balance between base-forming and acid-forming foods. If the diet is adequate, with a liberal supply each day of milk, vegetables, and fruits, cereals and protein-rich foods provision will be made for the necessary balance. Also, the normal, healthy body can generally make proper use of the food eaten regardless of its basic or acidic property.

ACTIVITIES

1. Classify the foods you have eaten during the past three days according to the six groups of food constituents. Which ones appear most often? Which the fewest times? To what extent are all groups represented? Repeat for menus obtained from several sources. How do the results compare?
2. Class make a chart of the food constituents, their function in the body, their nature, their food sources, and other items as desired.
3. Formulate a minimum list of foods that would furnish all the needed minerals; all the needed vitamins; both the needed minerals and vitamins.
4. List the foods most often lacking in the diet of college women. Do the same for other groups of people. How do the lists for these groups compare?
5. Show how several foods are each a good source of two or more essential food constituents.

PROBLEM 4 *How is a person's food requirement determined?*

If good nutrition is to be maintained, the food eaten must meet the body's requirement for energy, for building and repair of tissue, and for regulation of body processes. These requirements are specific and may be estimated with some degree of accuracy when a person's age, sex, size,

and activity are known. Personal likes and dislikes, economic status, and social customs may influence food consumption but affect the food requirement but little and only indirectly. Basic nutritional requirements remain unchanged.

Energy requirement

No matter how quiet a person may be, his body is constantly at work. Certain processes and activities always gc on as long as life continues. The blood must circulate and the heart must beat. Breathing must take place and elimination of body wastes must be carried on. Beyond these basic activities there are many others, varying in degree of strenuousness, in which people engage. All these require energy, which must be supplied by the food taken into the body. Carbohydrates, fats, and proteins, when oxidized or burned in the body, furnish energy. However, partly because of expense, protein is not widely recommended or used as a chief dietary source of energy. Foods classed as "protein-rich" should be the source of 10 to 15 per cent of the total energy requirement. Fats should furnish 20 to 30 per cent of the total energy. This amount is well utilized by the body and also provides the desired staying quality to the diet. The remaining 55 to 70 per cent of the energy requirement should be met by "carbohydrate-rich" foods, such as cereals, bread, potatoes, other vegetables and fruits and sugar.

The energy or fuel value of a food is measured in terms of calories. A calorie, indicated by cal., is the amount of heat required to raise the temperature of one kilogram of water one degree Centigrade or one pound of water four degrees Fahrenheit. A gram of carbohydrate has an energy or fuel value of four calories; a gram of fat nine calories; a gram of protein four calories. The body's energy requirement is stated in terms of calories. The daily requirement of a woman may range from 2000–2600 calories or more, and the daily requirement of a man, from 2500 to 3700 calories or more.

The energy need depends chiefly upon the activity, age, and size, but also upon climate and season. A tall person requires more calories than a short one of the same weight engaging in similar activity. An individual doing heavy work requires more calories than one of the same size engaged in sedentary activities. A cold climate tends to make the energy requirement higher than a warm one under conditions otherwise similar.

The energy requirement for women and men is practically the same, provided they are of similar size and are engaging in similar activities. The same is true of girls and boys. Several methods are used to estimate

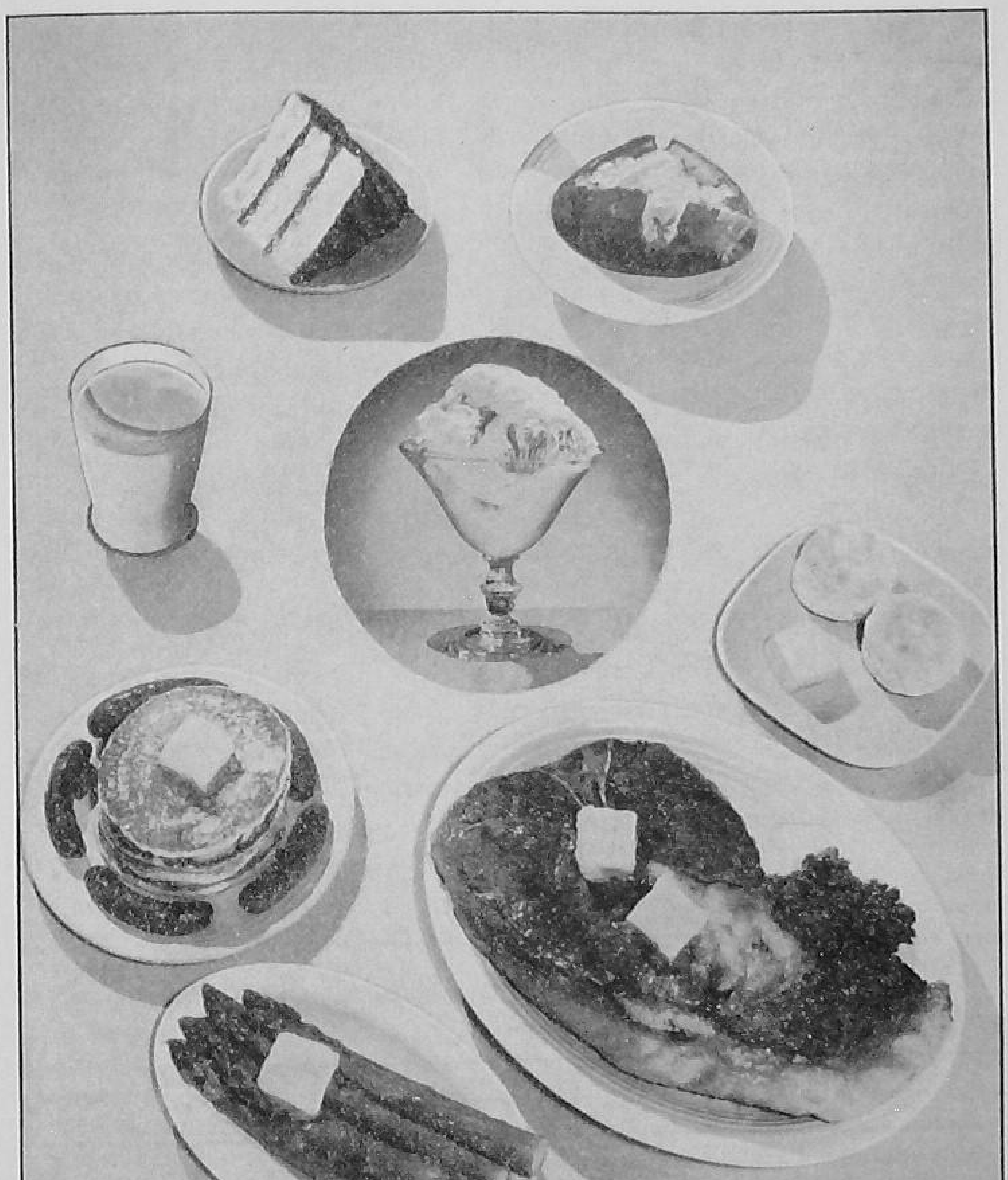
the number of calories required. For boys and girls up to seventeen, a basis of computation commonly used is calories per pound, the requirement per pound decreasing as the age increases.

For children from 1 to 6 months the daily energy requirement is 50 to 45 calories per pound; from 7 months to 3 years, 40 calories; from 4 to 6 years, 38 to 34 calories; and from 7 to 9 years, 36 to 32 calories. At 10 years girls, as a rule, become less active than boys and therefore require less calories. Girls from 10 to 13 years have an energy requirement of 32 to 27 calories and those from 14 to 17 years, 27 to 18 calories. Boys of corresponding ages require 34 to 30 calories and 30 to 23 calories, respectively. For persons above this age the requirements are stated in terms of calories per pound per hour according to the kind of activity. Table 4 shows the calories per pound per hour for a number of activities. In estimating the daily caloric requirement, the average or middle weight of the weight zone should be used unless the individual is extremely under- or overweight. The underweight person would do well to use the highest weight for computation and the overweight person the lowest.

TABLE 4. ENERGY REQUIREMENT FOR VARIOUS ACTIVITIES

Activity	Calories per Pound per Hour
Sleeping, awake lying still, sitting (reading, studying, talking and visiting, listening to radio, writing, mending and hand sewing)	2/5–½
Standing, dressing, and undressing, taking notes in class	3/5
Laboratory work (sitting), sewing on machine, singing, playing piano	¾
Light exercise (washing dishes, keeping room in order, cooking for small family, helping with preparation of meals, typing rapidly, ironing, laboratory work (standing) driving automobile)	¾–1
Moderate exercise (walking to school slow to moderate rate, daily cleaning of room, floor work in physical education, mopping, light laundry)	1¼–1¾
Active exercise (weekly cleaning of entire house, scrubbing, family washing, intramural sport contests such as basket ball, volley ball, dancing, walking rapidly)	2–3
Very active exercise (swimming, running, horseback riding, bicycling)	4–7

A college girl weighing 135 pounds requires from 2400 to 2650 calories per day if her activities are distributed as follows: eight hours sleeping, five hours sitting, two hours standing, four hours light exercise, three hours moderate exercise, two hours active exercise. Another who weighs 120 pounds needs 2100 to 2225 calories if her activities are distributed as follows: nine hours sleeping, seven hours sitting, one hour standing, four hours light exercise, two hours moderate exercise, and one hour active



Courtesy of National Dairy Council

Fig. 13

Standard servings of various foods differ widely in caloric value: Chocolate cake, 450; milk, 140; butter, one square, 100; four griddle cakes, 400; five sausages, 500; asparagus, seven stalks, 25; porterhouse steak, 1000; two biscuits, 200; baked potato, 100; ice cream, 300.

exercise. If a person is underweight he should increase the caloric intake by adding 5 to 25 per cent to the standard requirement, according to the extent he is underweight. The reverse is true in the case of overweight. When the total caloric requirement is known, food should be chosen to furnish the amount needed.

A briefer method that gives a fairly accurate estimate of caloric needs is sometimes used. If a person stays indoors and takes little exercise, the calories needed are determined by multiplying the average or middle weight of his weight zone by 15. If his activities are considered light, multiply by 17 or 18; if moderate, by 19 or 20; and if active, by 21, 22, 23, 24, or 25, depending upon the degree of the total activity. The underweight person, as in the longer method, should use the highest weight of the zone for computation and the overweight the lowest.

The caloric value of food has been determined for most of the commonly used foods. This is often given in terms of common servings. For example, one cup of whole milk yields 140 calories; one slice of whole wheat bread, 95 calories; one tablespoon of butter, 100 calories; and one-fourth of a large head of lettuce, 20 calories. By use of a list that gives the caloric values for servings of foods classed largely as carbohydrate, protein, and fat, observation of the suggested dispersion of the energy requirement among these classes of food nutrients is made relatively easy. Also the total caloric intake may be quickly estimated.

TABLE 5. APPROXIMATE CALORIC VALUES OF SOME COMMON FOODS

Caloric values are given in numbers that are multiples of five to simplify the estimating of total calories.

Food	Size of Serving	Approximate Calories
Foods classed as largely carbohydrates:		
Apples, raw	1 medium	75
Apple pie	⅙ medium pie	400
Apple sauce	½ cup	95
Apricots, canned	3–4 and 2 T. juice	75
Apricots, fresh	2–3	55
Apricots, dried	4–6 halves	100
Asparagus, raw	8–12 stalks 5″	25
Asparagus, creamed	¼ cup	100
Bananas, fresh	1 medium	100
Beans, string, fresh	1 cup	25

Food	Size of Serving	Approximate Calories
Beets, sliced, fresh	1 cup	65
Biscuits, baking powder	1 medium	100
Blackberries, fresh	½ cup	40
Blanc mange, chocolate	½ cup	220
Blanc mange, plain	½ cup	150
Bread, whole wheat	1 slice, ½″	55
Bread, white enriched	1 slice, ½″	60
Bread, white, raisin	1 slice, ½″	65
Cabbage, raw	1¼ cup	30
Cake, angel	piece 3″ circumference	140
Cake, cup, plain	1 medium	200
Cake, plain	piece 2″ x 2″ x 1″	110
Cake, sponge, hot water	piece 3″ circumference	155
Cantaloupe	½ medium	45
Carbonated beverages	6 ounces	80
Carrots, raw	2, 4″ long	40
Carrots, steamed, cubed	½ cup	20
Cauliflower, steamed	1 cup	30
Cauliflower, raw	1 cup	25
Celery	¾ cup or 4 stalks	20
Cherries, sour, fresh, stoned	1 cup	65
Cherries, sweet, fresh, stoned	1 cup	65
Chocolate, bitter	1 square	140
Chocolate cream mint	1	50
Chocolate fudge	piece 1½″ x 1″ x ¾″	100
Cocoa, powdered	1 T.	20
Coconut, prepared	⅓ cup	115
Corn, canned	⅓ cup	60
Corn, green	1 medium ear	85
Corn syrup	½ cup	470
Cornflakes	1 cup	50
Cornmeal, cooked	⅔ cup	80
Cornmeal, raw	¼ cup	130
Cornstarch	1 T.	35
Crackers, graham	1	35
Crackers, soda	1	30
Cranberry jelly	2 T.	100
Cream pies with meringue	⅙ medium pie	300
Cucumber, fresh	½ cup or 1 small	15
Dates, unstoned	3–4	85
Doughnuts	1	170
Figs, dried	2 large	100
Flour, wheat, white, enriched	1 cup	405
Flour, whole wheat	1 cup	400
Fruit Cocktail	⅜ cup	100

Food	Size of Serving	Approximate Calories
Grapefruit	½ large	100
Grapenuts	⅓ cup	100
Grapes, Concord, Delaware	small bunch	80
Grapes, Malaga, Tokay	small bunch	75
Griddle cakes	1 cake 4″ diameter	80
Hominy grits, cooked	1 cup	25
Honey, strained	1 T.	15
Lemon juice	½ cup	10
Lemons	1 medium	25
Lettuce	¼ large head	20
Macaroni, cooked	½ cup	230
Maple syrup	1 T.	50
Mince pie	⅙ medium pie	455
Muffins, plain	1 medium	115
Oats, rolled, cooked	⅔ cup	100
Onions, raw	1 small or 3 T.	10
Orange juice	½ cup	55
Oranges	1 medium	50
Parsnips, cooked	1 medium or 1 cup	95
Peaches, canned	2 halves, 3 T. juice	85
Peaches, fresh	1 medium	50
Peaches, dried	4 medium halves	145
Pears, canned	2 halves, 2 T. juice	80
Pears, fresh	1 medium	70
Peas, canned	½ cup	55
Peas, dried, raw	2 T.	85
Peas, green, shelled	¾ cup	75
Pineapple, canned	1 slice, 3 T. juice or 1½ cups shredded	90
Pineapple, fresh	1 cup	74
Potatoes, sweet, baked	½ medium	100
Potatoes, white, raw	1 medium	100
Potatoes, white, creamed	½ cup	150
Prunes, dried	4 medium	75
Prunes, stewed	3 medium and 2 T. juice	100
Raisins, dried seeded	¾ cup	320
Raspberries, fresh	¾ cup	75
Rhubarb, fresh	1 cup	20
Rice, steamed	1 cup	200
Rice pudding, creamy	½ cup	110
Rolls, yeast	1 medium	120
Salad, chicken	½ cup	235
Salad, tomato, lettuce	1 serving	100
Sauce, white medium	¼ cup	110
Spinach, cooked	½ cup	25

Food	Size of Serving	Approximate Calories
Squash, Hubbard, cooked	½ cup	50
Strawberries, fresh	¾ cup	40
Sugar, brown	1 T.	50
Sugar, granulated	1 T.	50
Sugar, powdered	1 T.	30
Sundae, vanilla ice cream with chocolate sauce	½ cup	220
Tapioca, cream	½ cup	190
Tomato juice	½ cup	25
Tomatoes, canned	½ cup	25
Tomatoes, fresh	1 medium	30
Turnip greens, cooked	½ cup	20
Turnips, cooked	½ cup	20
Waffles	1, 6" diameter	215
Watermelon	piece 2½" x 2" x 3"	85
Wheat, shredded	1 large biscuit	100
Yeast, compressed	1 cake	25
Foods classed as largely protein:		
Almonds, chocolate	5	105
Almonds, salted	10–12	95
Beans, baked	½ cup	100
Beans, Lima, cooked	⅓ cup	100
Beans, navy, cooked	½ cup	105
Beef, hamburg steak, broiled	cake, 2⅓" diameter, ½" thick	120
Beef, round, broiled	piece 2½" x 3" x ½"	125
Beef, sirloin steak, lean, broiled	piece 4" x 3" x ¾"	350
Buttermilk	1 cup	85
Cheese, American	1" cube	115
Cheese, cottage	⅓ cup	75
Chicken, lean meat, cooked	3 slices 3½" x 2½" x ¼"	115
Chocolate beverage made with milk	¾ cup	210
Cocoa beverage made with milk	¾ cup	175
Eggs, scrambled	½ cup	180
Eggs, whole	1	75
Fish, lean, broiled	piece 4" x 2¼" x ⅔"	125
Gelatin, granulated	1 T.	35
Ham, baked	piece 4" x 2½" x ¾"	280
Ham, boiled	1 oz.	85
Ice cream, vanilla	⅓ cup	150
Jello	⅓ cup	75
Junket, plain	½ cup	115
Lamb chop, broiled	1	250
Lamb roast	slice 3½" x 4½" x ⅛"	200

Food	Size of Serving	Approximate Calories
Liver, raw	piece 4″ x 3″ x ⅝″	130
Milk, skimmed	1 cup	85
Milk, whole	1 cup	165
Oysters, raw	⅓ cup or 3½ large	70
Pork chop, broiled	1 medium	250
Salmon, canned	½ cup	205
Soda water with vanilla ice cream	⅔ glass	200
Soup, cream of pea	½ cup	135
Soup, cream of tomato	½ cup	125
Walnuts, English	10 meats or 1½ T. chopped	100
Foods classed as largely fat:		
Bacon, cooked	2 slices	100
Butter	1 T.	100
Cod liver oil	1 T.	100
Cottonseed oil	1 T.	125
Cream, 40%	½ cup	440
Cream, 18%	½ cup	245
French salad dressing	½ cup	470
Lard	1 T.	125
Mayonnaise dressing	1 T.	90
Oleomargarine, fortified	1 T.	110
Olives, green, unstoned	3–4	50
Olive oil	1 T.	135
Peanut butter	1 T.	90
Peanuts, shelled, roasted	9–10	50
Russian salad dressing	1 T.	100

Requirement for body building and repair

The demands of the body for building material are as fundamental and insistent as those for fuel. In childhood there is need for material that can be utilized both to extend the body structure and to maintain tissues already formed. In maturity, even though growth has ceased, the demands for maintenance have so increased that while life lasts the requirement percentage of these constituents remains relatively constant.

Protein is usually listed first among the building materials. Nitrogen, the element that characterizes protein, is essential for all life and activity. Growth cannot take place without it, nor can the daily repair of tissue. In selecting or planning one's diet, care should be taken that the proteins used are adequate, both in quantity and quality, either in themselves or in combination with each other. In the diet of the normal adult the daily

inclusion of a pint of milk, one egg, and one fourth of a pound of meat, or sometimes its equivalent in protein-rich foods such as nuts and legumes, perhaps assures adequate protein, because in a varied diet other foods will contribute enough protein to make up the day's need. However, a greater protein intake would be much safer. Though with care sufficient protein can be obtained from wholly vegetable sources, it is much better to include some protein foods from animal sources in the diet.

Among the minerals important in building and repairing body tissues and in regulating certain body processes are calcium, chlorine, cobalt, copper, iodine, iron, magnesium, phosphorus, potassium, sodium, and sulfur. Unlike protein, these foods furnish no energy. Provision for adequate minerals is greatly simplified by the fact that usually foods that are high in the essential minerals have other important roles in nutrition. Milk, a good source of calcium and phosphorus, is an excellent source of protein; greens, high in iron, contain a large amount of vitamin A; protein foods supply sulfur; whole-grain products, rich in a number of the minerals and vitamins, give bulk to the diet.

Each day's meals should include at least one or two foods that are rich in each of the needed mineral elements. If one lives in a goiter region where the soil and water are lacking in iodine, the deficiency can usually be taken care of by the regular use of iodized table salt. When such is not the case a physician should be consulted.

Water is required both for the protoplasm of the body cells and for the regulation of body processes. It is the medium by which food is brought to the cells and by which the waste of the cell is carried out of the body. It regulates temperature. The quantity necessary for the performance of these various tasks is far greater than is commonly supposed. As the human body is estimated to be approximately two thirds water, the moisture content of the body of a person weighing 120 pounds would be 80 pounds. The water intake must be sufficient to provide for the maintenance of normal water content and should be based on probable water losses. Although much water is contained in food, additional amounts are required and should be taken throughout the day. A safe rule is to include at least six to eight glasses of water daily in the diet.

Requirement for body regulation

The importance of water and minerals in body regulation is at least equaled by that of the vitamins. To make adequate provision in the diet for the vitamins, one should include daily at least one food — better, two — that is particularly high in each vitamin.

The body requires a certain amount of roughage or bulk in the diet to function effectively. Digestion is stimulated and intestinal elimination is aided by this roughage or bulk. Starches, sugars, and fats have little bulk; fruits with the skins, most vegetables, and whole-grain products have much bulk. The difference in bulk between quantities of foods equivalent in energy is shown by the fact that one half ounce of butter and one and one fourth pounds of lettuce each yield 100 calories. Constant use of concentrated foods is to be avoided. The day's meals should include some foods high in roughage and bulk. Fats, though concentrated, aid in the prevention of constipation, and should also be included.

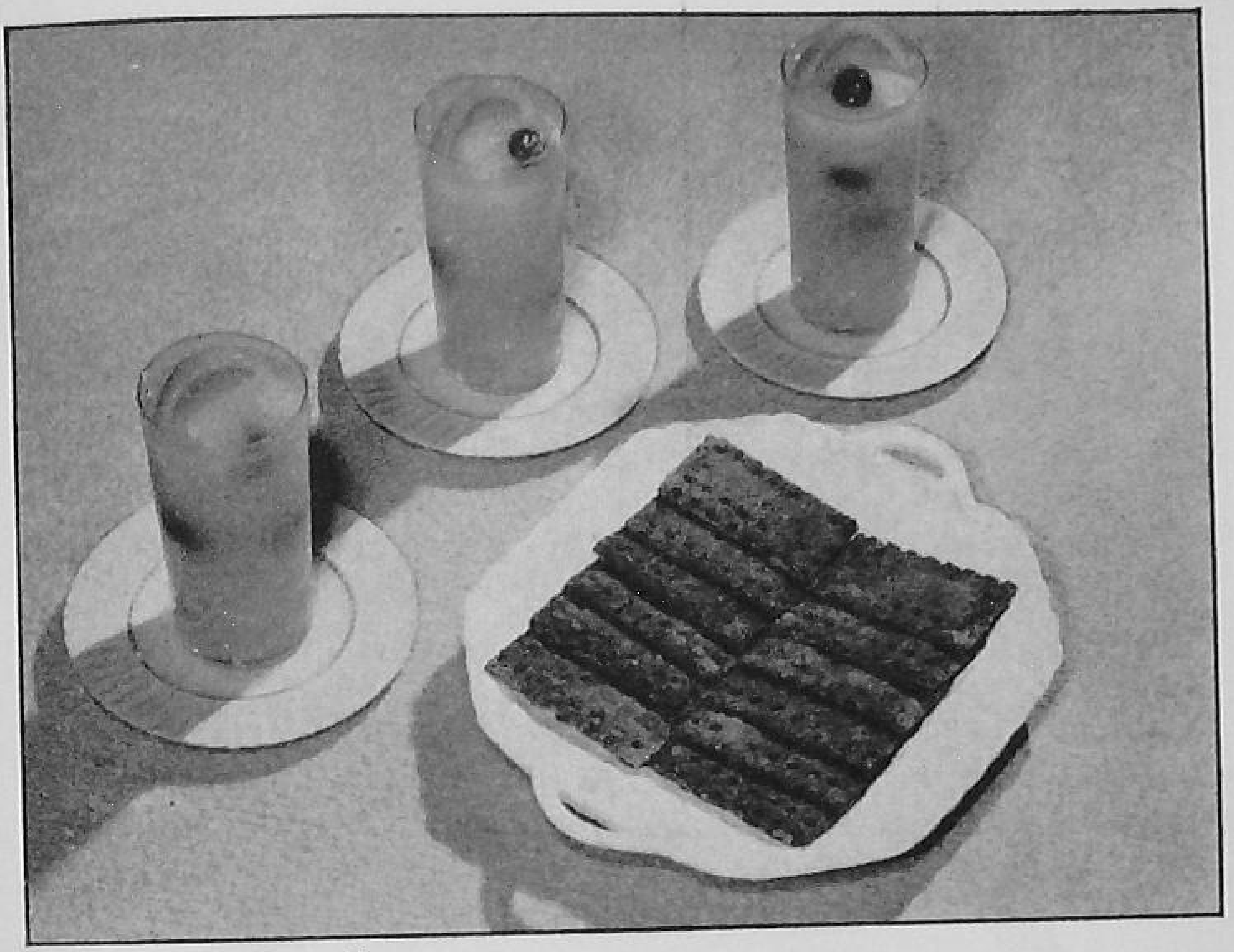
Regularity of meals

Of great importance in meeting the daily food requirement is the regularity of meals. Whether the prevailing meal pattern is three, four, five, six or seven meals each day, the regularity of the meals and the adequacy of the total day's food in each situation are essential. In this country, where the daily three-meal pattern prevails, these meals should not be markedly unbalanced in quantity and quality. One suggestion is to allow 500 to 700 calories for breakfast, 900 to 1000 for luncheon, and 1000 to 1100 for dinner, according to the total caloric requirement. A better plan might even be to make the meals approximately equal in caloric value.

Everyone needs a substantial breakfast every day. Frequently, college students rush off to their morning classes without taking time for breakfast. This is a dangerous practice, and if continued for any length of time will be a serious hazard to nutrition and health. Adequate food for the day is almost impossible to obtain in only two meals. If a person desires to study and do his college work efficiently, he must have sufficient food to carry on the morning's activities in a satisfactory way. Due consideration to the evenness of the period elapsing between meals should also be given, as wide discrepancies prevent the establishment of helpful routine habits in body functioning.

"Between-meal eating" is a practice generally to be avoided. Usually the food consumed at these times consists of highly concentrated and flavored foods, such as candies, sundaes, and various soft drinks. Such habits may result in overeating, though sometimes the desire for the regular meal is taken away, with the result that necessary foods are omitted from the diet. If one really needs food between meals, such foods as orange juice, tomato juice, or milk should be taken. These will be helpful rather than harmful to the body.

The day's meals should supply as nearly as possible an ample and bal-



Courtesy of Ralston Purina Co.

Fig. 14

A "between meal snack" which adds some "must have" food to the diet is the one above — wafers and a fruit drink. In certain instances the eating of such food between meals may be a desirable practice.

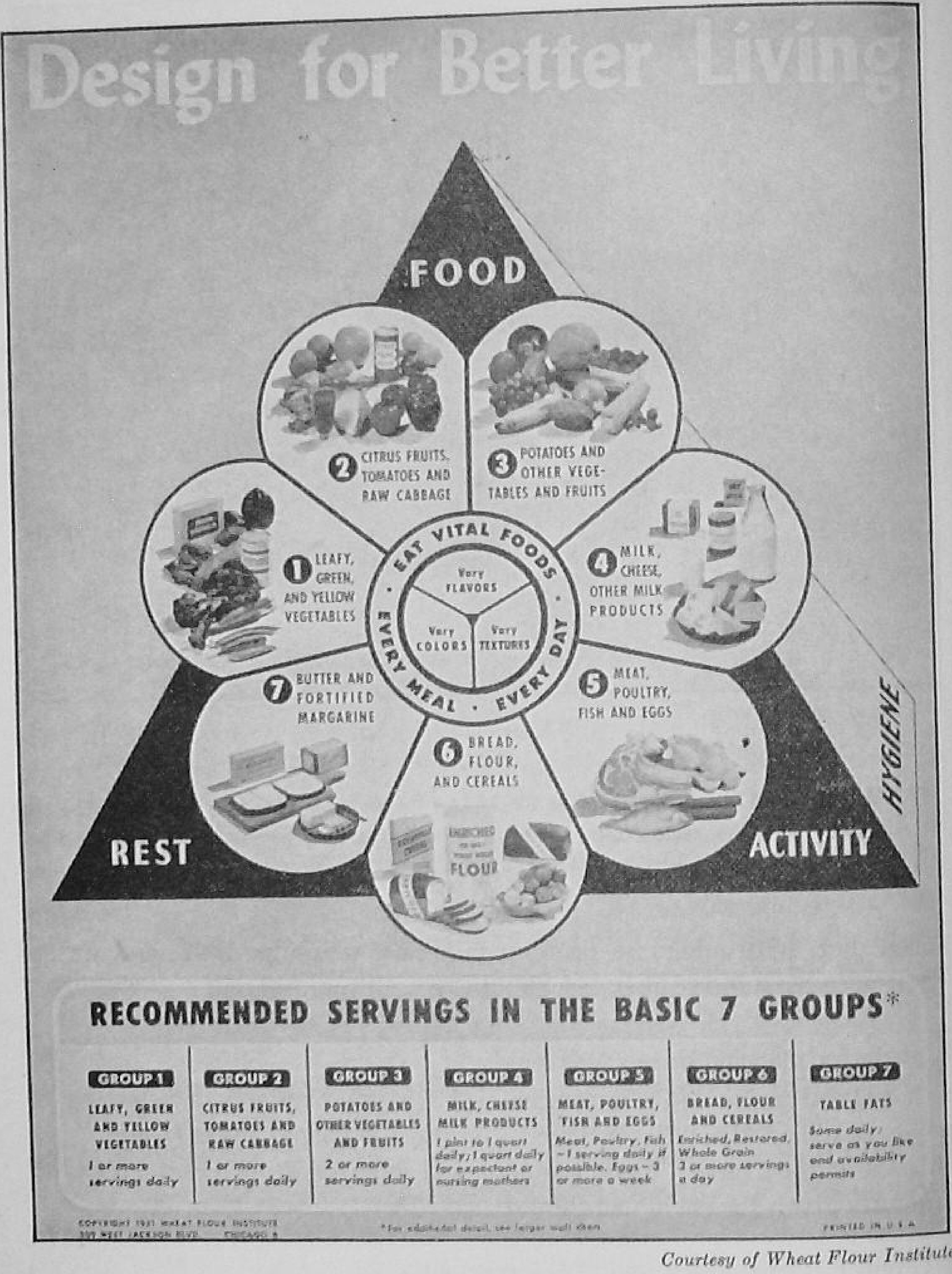
anced diet, with adequate protein, minerals, vitamins, bulk, and water. Each necessary food substance should be well represented.

A guide for planning or selecting meals

A helpful guide often recommended for the planning or selecting of meals is called the "Basic Seven" or the "National Food Guide." In this the "must have" foods are arranged in seven groups and suggested amounts given for each, as follows:

Group 1. Leafy, green, and yellow vegetables
(raw, cooked, frozen, canned).
One or more servings daily.

Group 2. Citrus fruit, tomatoes, raw cabbage, and other vitamin C foods.
One or more servings daily.



Courtesy of Wheat Flour Institute

Fig. 15

A helpful guide in selecting and planning adequate daily diets.

Group 3. Potatoes and other vegetables and fruits
(raw, cooked, frozen, canned, dried).
Two or more servings daily.

Group 4. Milk, cheese, ice cream.
Children — three to four cups of milk daily.
Adults — two or more cups of milk daily or equivalent.

1 oz. Cheddar cheese 12 oz. cottage cheese 2–3 large dips ice cream	= 1 cup milk

Group 5. Meat, poultry, fish, eggs, dried beans and peas, nuts.
One to two servings daily divided thus:
Meat, poultry, fish
(fresh, canned, or cured).
One serving daily if possible.
Eggs.
One daily or at least four per week.
Dried beans and peas, nuts.
Two or more servings per week.

Group 6. Bread, flour, cereals
(whole-grain, or enriched).
Every day.

Group 7. Butter, fortified or enriched margarine.
Some daily.

In addition to the "Basic Seven," eat other foods as desired to make up the needed calories for the day.

A college student with a limited food allowance, using these rules, selected the following meals at the college cafeteria. Their cost was not high and they furnished 2300 to 2500 calories per day.

Menu I

Breakfast

Grapefruit, ½
Sugar, 2 t.
Egg, 1
Toast, whole wheat, 1 or 2 slices
Butter or fortified margarine, 1 pat
Milk, ½ pt.

Lunch

Cheese fondue, 1 serving
Cabbage and carrot salad, 1 serving
Mayonnaise, 1½ T.
Bread, 1 or 2 slices
Butter or fortified margarine, 1 pat
Apple-raisin pudding and lemon sauce, 1 serving
Milk, ½ pt.

DINNER

Chicken fried steak, 1 serving
Brown rice, 1 serving
Gravy 1/4 c.
Harvard beets, 1 serving
Whole wheat roll, 1 or 2
Butter or fortified margarine, 1 pat
Vegetable relishes, 1 serving
Chocolate pie, 1 serving

Menu II

BREAKFAST

Sliced orange, 1
Farina, 1/2 c.
Milk, 1/2 c.
Sugar, 2 t.
Milk, 1/2 pt.
Butter or fortified margarine, 1 pat
Doughnut, 1 or 2

LUNCH

Scalloped eggs, 1 serving
Buttered spinach, 1 serving
Pineapple and grape salad, 1 serving
Whole wheat bread, 1 or 2 slices
Butter or fortified margarine, 1 pat
Gingerbread, 1 serving
Milk, 1/2 pt.

DINNER

Liver and bacon, 1 serving
Buttered potatoes, 1 serving
Creamed green beans, 1 serving
Cloverleaf rolls, 1 or 2
Butter or fortified margarine, 1 pat
Tossed vegetable salad, 1 serving
French dressing, 1 T.
Fresh apple, 1

If you have one dollar and seventy-five cents per day to spend for total food at the cafeteria or café, try to spend it in this proportion:

25 to 30 cents for vegetables, including one leafy vegetable
20 to 25 cents for fruit
20 to 25 cents for milk
55 to 65 cents for meat, poultry, fish, beans, eggs and cheese
20 to 25 cents for bread and cereals
5 to 10 cents for butter or margarine
15 to 20 cents for desserts or other sweets

ACTIVITIES

1. Determine your daily energy requirement in calories.
2. Plan a day's diet for yourself that would be adequate and properly balanced in every respect. How do the meals of this diet compare with those that you ate yesterday and the day before?
3. State all of the reasons you can for eating a substantial breakfast every morn-

ing. Give an example, that you know, of the ill effects of going without breakfast.

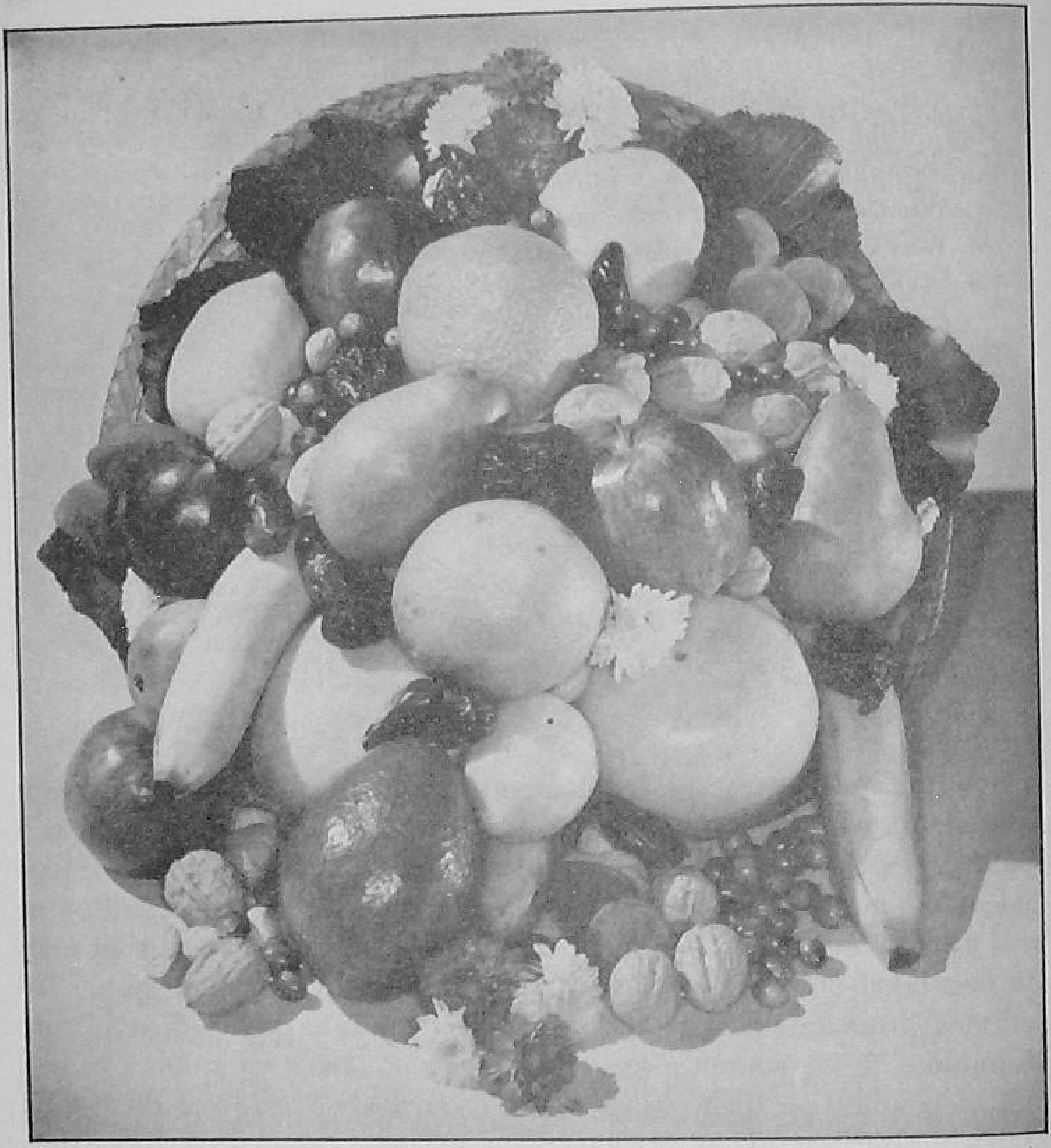
4. Evaluate your meals of a recent day according to the "Basic Seven" guide. How do the meals measure up to these standards?
5. Form into "buzz" groups and discuss the following:
   (*a*) What effect does between-meal eating have upon you?
   (*b*) Why do people eat between meals?
   (*c*) What foods are included in between-meal eating? When is this type of eating desirable?
   (*d*) What foods do you usually eat between meals? Why?

PROBLEM 5 *What may influence the food eaten?*

Not infrequently the assertion is made that, if adequate wages were assured, the workers and their families would naturally be well fed and healthy. Such an assumption is unwarranted. It presents an erroneous and over-simplified concept of the factors affecting the consumption of food by human beings. There was a time — long ago — when what man ate depended on what he could obtain from the world about him. He had meat from animals he killed, berries and seeds he gathered, and fruits he found safe for consumption. Even so, individuals fared more or less well, depending on their clearness of vision, their effort, and their skill. Man's mastery of his environment has changed the skills necessary to obtain adequate food. At the same time that increased knowledge directs him to wise selection, however, the social implications of food and eating have become numerous and impelling. Thus he may find that his habits of eating are largely shaped by forces not always fully understood or controlled.

Available foods

Formerly the type of food produced in the community undoubtedly played a large part in dietary practices. In a locality where rye was the only cereal readily grown, it was included almost to the exclusion of all other cereals in the diet. Similarly, in countries or localities where rice



Courtesy of What's New in Home Economics

Fig. 16

Even in the winter many fresh fruits are available.

was produced in large quantities, it was the chief cereal in the daily fare. The same held true for the highly perishable fruits and vegetables. Today, with the improved food preservation and distribution, even the most perishable foods are available over large areas of this country. Fresh meat, milk, and vegetables are obtainable in cities remote from the scenes of their production, and inland villages of the Northwest and Midwest have available citrus fruit with a regularity and at low prices that

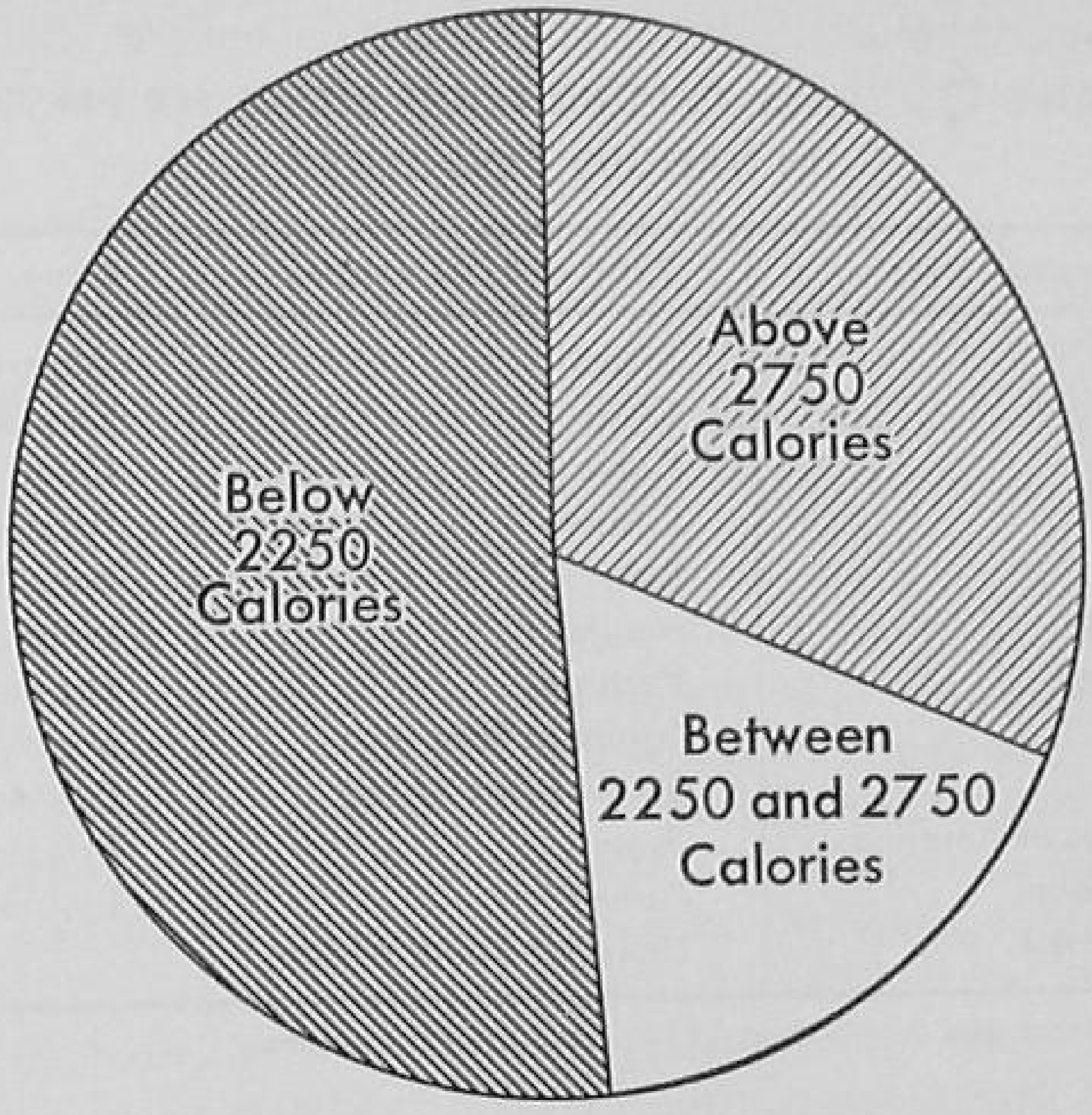


Fig. 17

World Caloric Consumption Daily Per Person. The average daily minimum caloric requirement for a person is considered to be 2550 to 2650 calories. Thus the diets of more than one-half of the world population are inadequate in calories and great numbers of people are not getting enough to eat. It is therefore impossible for them to do much work or to be very active in any way.

did not prevail half a century ago. The improvement in canning processes, the development of the frozen food industry, and the extension of the list of foods preserved in these and other ways, place a wide variety of foods at the disposal of people everywhere in the United States under normal conditions. The availability of a large number of foods at prices people can afford to pay markedly influences the daily diet and its adequacy.

The wide variation in dietary patterns among people throughout the world depends to a large extent upon the available food supply. This is true both in respect to the quantity of calories provided and the nutritive quality of the diets. In countries where there is an abundant food supply the dietary pattern indicates a distinct trend toward adequacy. In countries where the food supply is limited the dietary pattern shows lack in quantity and quality, the extent of each depending upon the degree of limitation. War and such other catastrophes as floods, droughts, and earthquakes, make drastic changes in peoples' dietary patterns, many of which are due to a reduction in the food supply. When followed over

TABLE 6. DAILY CALORIC FOOD INTAKE PER PERSON IN VARIOUS COUNTRIES *

2700 calories and over	2200 to 2700 calories	Below 2200 calories
Argentina	Brazil	Algeria
Australia	Chile	Ceylon
Belgium	Cuba	China
Canada	Greece	Formosa
France	Italy	Indo-China
Netherlands	Mexico	India
New Zealand	Portugal	Japan
Norway	Southern Rhodesia	Malaya
Sweden	South-West Africa	Pakistan
United States of America	Spain	Philippine Islands
United Kingdom	Turkey	Tunisia
West Germany	Union of South Africa	

* The State of Food and Agriculture, 1954, FAO United Nations.

TABLE 7. DAILY INTAKE OF ANIMAL PROTEIN PER PERSON IN VARIOUS COUNTRIES *

Over 30 grams of animal protein	Over 15 and under 30 grams of animal protein	15 grams and less of animal protein
Argentina	Brazil	Algeria
Australia	Chile	Ceylon
Belgium	Cuba	China
Canada	Greece	Formosa
France	Italy	Indo-China
Netherlands	Mexico	India
New Zealand	Portugal	Japan
Norway	Southern Rhodesia	Malaya
Sweden	South-West Africa	Pakistan
United States of America	Spain	Philippine Islands
United Kingdom	Turkey	Tunisia
West Germany	Union of South Africa	

* The State of Food and Agriculture, 1954, FAO United Nations.

The daily amount of protein recommended by the National Research Council for women is 55 grams and for men, 65 grams. Well over one-half of this protein should be from animal sources. Countries high in calories of food per person tend to be high in animal protein consumption.

extended periods of time such patterns result in malnutrition and lowered physical vigor and resistance to disease for most of the people.

Tradition and customs

National and religious traditions are often important in determining the food included in the diet. The influence of national tradition is aptly phrased by Robert Southey, an English poet and essayist of the early nineteenth century, in whose day one may have eaten

> sausages for breakfast at Norwich, sally lunns at Bath, sweet butter in Cumberland, orange marmalade at Edinburgh, Findon haddocks at Aberdeen, and drunk punch with beef-steaks to oblige the French if they insisted upon obliging him with a *déjeuner à l'Anglaise.* He would have eaten squab-pie in Devonshire, sheep's-head with the hair on in Scotland, and potatoes roasted on the hearth in Ireland; frogs with the French, pickled herrings with the Dutch, sour-krout with the Germans; macaroni with the Italians, aniseed with the Spaniards, garlic with anybody; horse-flesh with the Tartars; ass-flesh with the Persians; dogs with the North-Western Indians, curry with the Asiatic East Indians, birds' nests with the Chinese, mutton roasted with honey with the Turks, pismire cakes on the Orinoco, and turtle and venison with the Lord Mayor; and the turtle and venison he would have preferred to all the other dishes, because his taste, though catholic, was not indiscriminating.

Not only are there national dishes, there is also a characteristic meal pattern in each country. The Norwegians, the Danes, and the Dutch normally have four to seven meals a day. We in the United States announce our pattern as "three square meals a day." The Greeks are accustomed to two substantial meals daily.

Often religion prescribes or prohibits the eating of certain foods. For example, pork, including lard, is prohibited by the Jewish faith, which also decrees that milk and meat may not be served in the same meal. Also, if beef or mutton is used the animal must be slaughtered and dressed according to prescribed rites, and only the forequarter may be eaten. Meat is prohibited on certain days by the Catholic faith, and the followers of Hinduism eliminate meat entirely from the diet.

The type of the meal itself, as well as the characteristic dishes included, is often largely determined by family custom. If in days of great activity, ham and eggs were included in the breakfast and a number of heavy foods in the other meals, these foods may continue to be a component part of the family diet. Thus the meals may remain heavy long after the changed daily routine of the family makes their inclusion unnecessary or even undesirable. In many Midwestern homes, the custom of serving codfish

balls on Sunday morning, observed in the family home on the Atlantic seaboard many generations ago, still is followed in a locality far from the habitat of the cod. In some homes, jelly is served with every meal; in others, hot bread is essential.

Economic status

In this country with wide extremes in the economic status of its families, there are wide variations in food budgets for families of the same size, with attendant differences in expenditures for particular foods. These differences are minimized and tend to disappear with marked downward shifts in food costs, just as they are accentuated with marked upward trends in the cost of certain foods. In the homes of the wealthy, fruit out of season may be served for breakfast as a matter of course. Expensive roasts may comprise the *pièce de rèsistance* of the dinner, and costly relishes and pickles, the *hors d'œuvres*. Though the budget of a family of moderate means will not provide for fruit out of season, nor for other foods of the luxury class, it will permit variety and opportunity for choice. With the food budget possible for the lower income levels, the possibility of choice is limited, and it becomes increasingly necessary to depend more largely on cereal foods for the main or substantial part of the meal. The problem then is one of supplementing the cereal with foods necessary for the adequate diet. This is accompanied by increased difficulty in providing palatable meals. A food is usually omitted from the diet when its cost becomes disproportional to that of similar articles that might replace it. This is particularly true when the allowance for food is limited. Especially important in situations like this is knowing less expensive alternates for the more expensive essential foods.

Personal likes and dislikes

Likes and dislikes often exert undue influence, and many people make personal likes the basis of the inclusion or exclusion of a food in their diet. The failure to include milk or other essential foods in the diet for such a reason is far too common. With few exceptions a person can learn to eat any wholesome food with keen enjoyment despite opinions to the contrary. However, until people are willing to subject their food likes to intelligent scrutiny and determine whether they should be continued or revised, their dietary practices will reflect childhood prejudices and foolish notions rather than adult choices.

Ease of food preparation

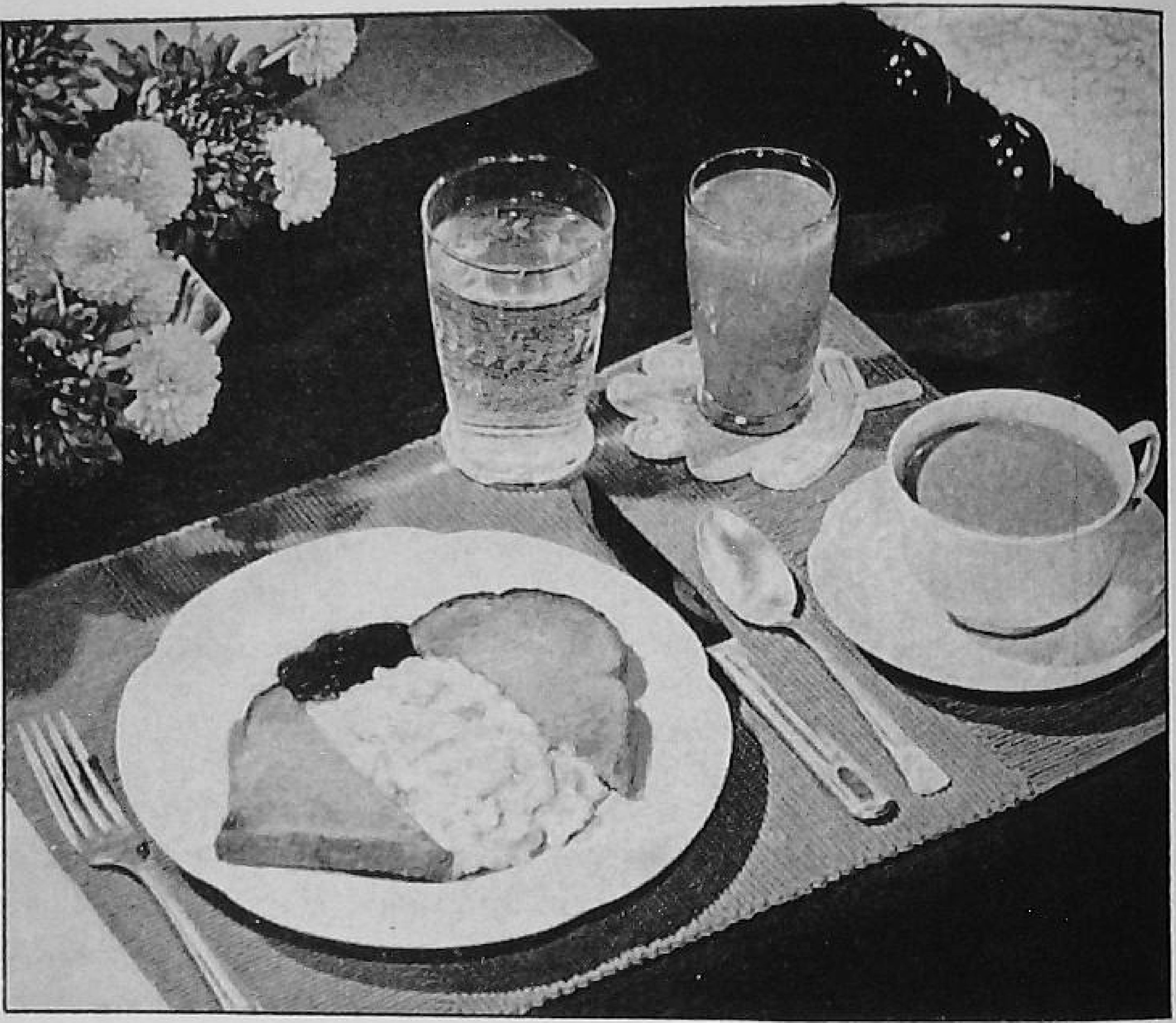
More and more in this country ease of preparation is having a marked

influence upon the food that people are eating. Homemakers as well as others are deeply interested in this aspect of meal planning, preparation and service. Along with the widened interest and participation of women and girls in community activities and the increased employment of women outside the home has come an emphasis upon ease in food preparation. In homes everywhere the time required for getting a meal is being kept to a minimum, and foods are selected and menus planned with this in mind. Many things are contributing to this trend. Among these are the development of simplified methods of food preparation, the increased use of raw vegetables and fruits, and the availability of attractive and palatable foods that are quickly and easily prepared such as mixes of all types, instant beverages, brown-and-serve foods, frozen pre-cooked foods and ready-to-serve foods. Underlying all of this is the great desire of families and individuals to have more time for satisfying group and personal living. Though ease of food preparation is an important consideration it should not control the situation to the extent that nutrition is impaired or the total budget unbalanced.

Knowledge of food needs

The diet of the American people reflects directly the increasing knowledge of foods and the body's need for them. What is in some countries technical information, known only by the specialists in physiology and nutrition, is in this country commonplace information possessed by women in their homes. The widespread instruction carried on by the Home Economics extension service, the contributions made by current magazines and the radio, added to the lessons on foods and nutrition given in the schools, have informed people generally of their food needs and how to meet these. This widespread knowledge of food needs has affected the dietary practices and habits of the American people. The result has been a great improvement in the dietary pattern of this country during the last twenty-five years.

There are, however, great numbers of people in the United States, food-rich country that it is, who do not get enough of the essential foods even though they can afford to buy whatever food they wish. Furthermore, many of these persons know the foods that they should eat. The worst offenders are the teen-age girls who endanger their health by inadequate food intake, irregular meals, no breakfasts and other bad dietary practices. Studies indicate, too, that some mothers of teen-age girls have no better food habits either. Though knowledge of nutrition and sufficient money for food are of utmost importance in dietary improvement,



Courtesy of Evaporated Milk Association

Fig. 18

Start the day right with a hearty breakfast.

these are not enough. To be effective this knowledge and purchasing power must be carried over into human excellence which means improved nutritional status and practices.

ACTIVITIES

1. Make a list of the factors that most affect your daily food intake.
   (*a*) Why do these have the influence that they do?
   (*b*) How does your list compare with those of other members of the class?
   (*c*) Which factors might be undesirable if allowed to influence your daily diet to a large extent? Why?
2. Participate in a class discussion of the following questions:
   (*a*) What family customs determine the foods served in your home? How long have these been customs in your family? How did these begin?

(b) How does family custom influence your choice of food? Do you regard this influence good or bad for you? Why?

(c) What recent changes have been made in the foods served in your home? How do you regard these changes?

3. Bring to class a menu of a characteristic day's meals of a given group of people, a country, or a period of time. Class evaluate these menus in terms of the "Basic Seven." How do these menus compare with the daily meals served in your home?
4. Class compile a list of prevalent local food customs; reasons or probable reasons for their development; and effects or possible effects on persons following these.

PROBLEM 6 *How is a record of food intake evaluated?*

A way to be sure that one's diet is adequate is to keep a record of the food actually eaten over a definite period of time. After the facts have been ascertained, the food should be carefully evaluated for adequacy. A seven-day period is frequently used, although a longer period is sometimes advocated. As the food intake on any two days may vary widely, a longer study will, perhaps, give a more typical picture.

The dietary record should be kept carefully and all foods eaten during the time, whether between or at meals, estimated and recorded. The record sheet for one day should include the name of each meal, the place where the meal was eaten, the food eaten, the method of its preparation, and the quantity, and in addition, the kind and amount of food eaten between meals. Other facts should be listed if additional information is desired. When the record is completed, the food intake for this period should be checked with the guides for planning and selecting meals as given in Problem 4 of this unit. If it fails to comply with these standards by more than one point, the diet is likely to be deficient in more than one respect.

Before undertaking further study of the dietary record, it is well first to determine specifically one's food requirement. By use of Table 1, determine your optimum weight. If your weight zone is 128 to 158 pounds, any weight in this zone that appears to be most suitable can be used. Second, estimate in hours the time spent in different types of activities

according to Problem 4. Third, with the weight and the activities as a basis, determine the total calories needed. If preferred, the shorter method of computation suggested may be used. Unless one is unusually small in height and body structure for a college girl, a total requirement much under 2000 calories should be questioned and re-estimated.

Fourth, classify the data on the dietary record sheets for each day and total these on the summary record sheet. Then estimate the total calories. This can be done by referring to the table of caloric values (Table 5). Calories for each food should be listed and the total found. The calories for each meal should be determined, and to this result should be added the calories for food eaten between meals.

Fifth, compare the total caloric intake and the total caloric requirement. Also compare the total calories for each day to see if the food intake is approximately the same each day. If this is relatively constant, the average total calories can be used for further comparison. If there is wide variation from day to day, the consumption on typical days should be averaged. Wide variation from day to day in the food intake is not a practice to be recommended. If the total food intake is far below or above the requirement, in all probability the proper amount of food is not being eaten. However, if the amount of food eaten is theoretically correct and the weight is at or below the underweight line, further investigation of possible causes should be made. If the condition persists, a physician should be consulted.

The proportion of calories eaten at the three different meals of any one day should be compared. Comparison should also be made between the caloric intake for the same meal on the different days. In determining whether the apportioning of the calories to the meal has been satisfactory, the standards given in Problem 4 should be used. If the division is breakfast 100 calories, luncheon 400, dinner 1600, or breakfast 800, luncheon 200, dinner 1100, the distribution of calories can well be questioned. The frequent omission of meals makes such dispersion even more unequal. Meals cannot be omitted without possible hazard to health.

Total calories supplied by the food eaten between meals should be considered in relation to both total caloric intake and total intake at meals. If light caloric intake at a meal regularly follows a high between-meal intake, the situation is far from satisfactory. The type as well as the amount of food eaten between meals may bear a relation to the general dietary status. Some foods, such as milk, orange juice, and tomato juice, have often been found desirable to eat between meals.

SUMMARY RECORD OF FOOD INTAKE *

Name.................................... Date.................................... Place....................................

Day	Group I	Group II	Group III	Group IV	Group V	Group VI	Group VII			
	Green, leafy and yellow vegetables	Citrus fruits, raw cabbage and other vitamin C foods.	Other fruits and vegetables	Milk and milk products	Lean meat, poultry, fish, egg and legumes	Whole grain and enriched bread and cereals	Butter and fortified margarine	Coffee, tea and carbonated beverage	Water and other liquids	Sweets eaten between meals
Average										

* From dietary records begun in Problem 1.

FOOD SELECTION SCORE SHEET

Name.. Date..

Basic-7 Groups.	Possible Daily Score	Food	Daily Credits S	M	T	W	T	F	S	Total for Week	Av. Score
I	15	Green, leafy and yellow vegetables 2 servings 15 1 serving 10									
II	15	Citrus fruits, tomatoes, raw cabbage and other vitamin C foods 2 servings 15 1 serving 10									
III	10	Other vegetables and fruits 2 servings 10 1 serving 5 (not more than one serving of potatoes)									
IV	20	Milk 2 cups or more 20 1–1¾ cups 10 Alternates for 1 cup milk — cheese (Cheddar) 1 oz. cottage cheese 12 oz. ice cream, 2–3 large dips									
V	20	Protein-rich foods a) Lean meat, poultry and fish 2 servings 15 1 serving 10 b) Eggs 2 servings 10 1 serving 5 c) Dried legumes and nuts 1 serving 5									
VI	10	Whole grain and enriched bread and cereals 2–3 servings 10 1 serving 4									
VII	5	Butter and fortified margarine 2 T. (1 oz.) 5									
	5	Liquids other than milk 5 cups 5 4 cups 4 2 cups 2									
	100	TOTAL SCORES									
		Deductions a) Each meal omitted — 10 b) Meals at irregular hr. — 5 c) Sweets between meals — 5 d) More than 4 servings of tea, coffee and/or carbonated beverages — 5									
	100	DAILY SCORE									

Score: 95–100 indicates excellent food selection; 80–95, good; 75–80, fair; 75 and under, poor.

The protein intake should also be checked to see if complete proteins predominate and if adequate provision for protein needs has been made. At the same time the protein intake is studied, the carbohydrate and fat intake might well be considered to see how nearly these are meeting the standard suggested in Problems 3 and 4 of this unit.

The record should be checked to see if the minerals and vitamins are well represented. The various days should then be compared to see if these food elements are provided consistently each day according to the standards in Problems 3 and 4 of this unit.

A score card or sheet has been found quite helpful in evaluating the food intake, either for a day or for a longer period. By this means, one is enabled to see in what regard his diet is low or deficient and in what regard it is adequate and ample. The score card or sheet aids in obtaining a general picture of one's food intake and practices.

Suggestions for Using Food Selection Score Sheet and Summary Record of Food Intake

Green, leafy and yellow vegetables *

One-half to ⅓ cup equals one serving.

"Green vegetables" has reference to color, as in spinach, leaf lettuce, green beans, peas and new cabbage.

"Yellow vegetables" — carrots, pumpkin, squash, sweet potatoes, etc.

Citrus fruits, tomatoes, raw cabbage and raw salad greens *

One-half to ⅓ cup equals one serving.

One whole orange, tomato, or one-half grapefruit equals one serving.

* The use of the following letters will be helpful when indicating special types of vegetables and fruits:
C — tomato, raw cabbage, salad greens, fresh pepper, citrus fruits, strawberries, cantaloupe, etc.
G — green vegetables.
Y — yellow vegetables.
Cum — cumulative (mixed salad of vegetables or serving of vegetable relishes)

Other fruits and vegetables

One-half to ⅓ cup equals one serving.

One apple, banana, or peach equals one serving.

Do not count pies or pudding as fruit unless a full serving of fruit is assured.

Milk

Count in cups (½ pint).

Count cocoa, custard, cream soups, white sauce or milk gravy, etc., as half milk.

Count 12 ounces cottage cheese, 1 ounce Cheddar cheese, and 2–3 large dips of ice cream each as 1 cup milk.

Meat and other protein-rich foods

Count poultry and fish as meat.

Count hamburger meat in sandwiches as ½ or 1 serving according to the size of the serving.

Count cooked, dried beans as protein, not a vegetable; ½ to ⅓ cup as a serving.

Do not count bacon as meat.

Count 1 egg as one serving.

Bread and cereals *

1 serving equals 1 slice bread, 1 medium biscuit, muffin, or roll.

1 large bun equals 2 servings of bread. Two small biscuits or rolls equal 1 serving.

Count Boston brown bread or corn bread as whole grain bread.

* W — whole grain breads or cereals.
En — enriched breads or cereals.

Liquids

Count in cups (½ pint).

Include water, milk, cocoa, tea, coffee, clear soups, fruit juices, fountain drinks, etc., as liquids.

"Sweets or in-betweens" eaten between meals

Include candy, cake, cookies, pie, sundaes, carbonated beverages, or other sugar-rich foods.

ACTIVITIES

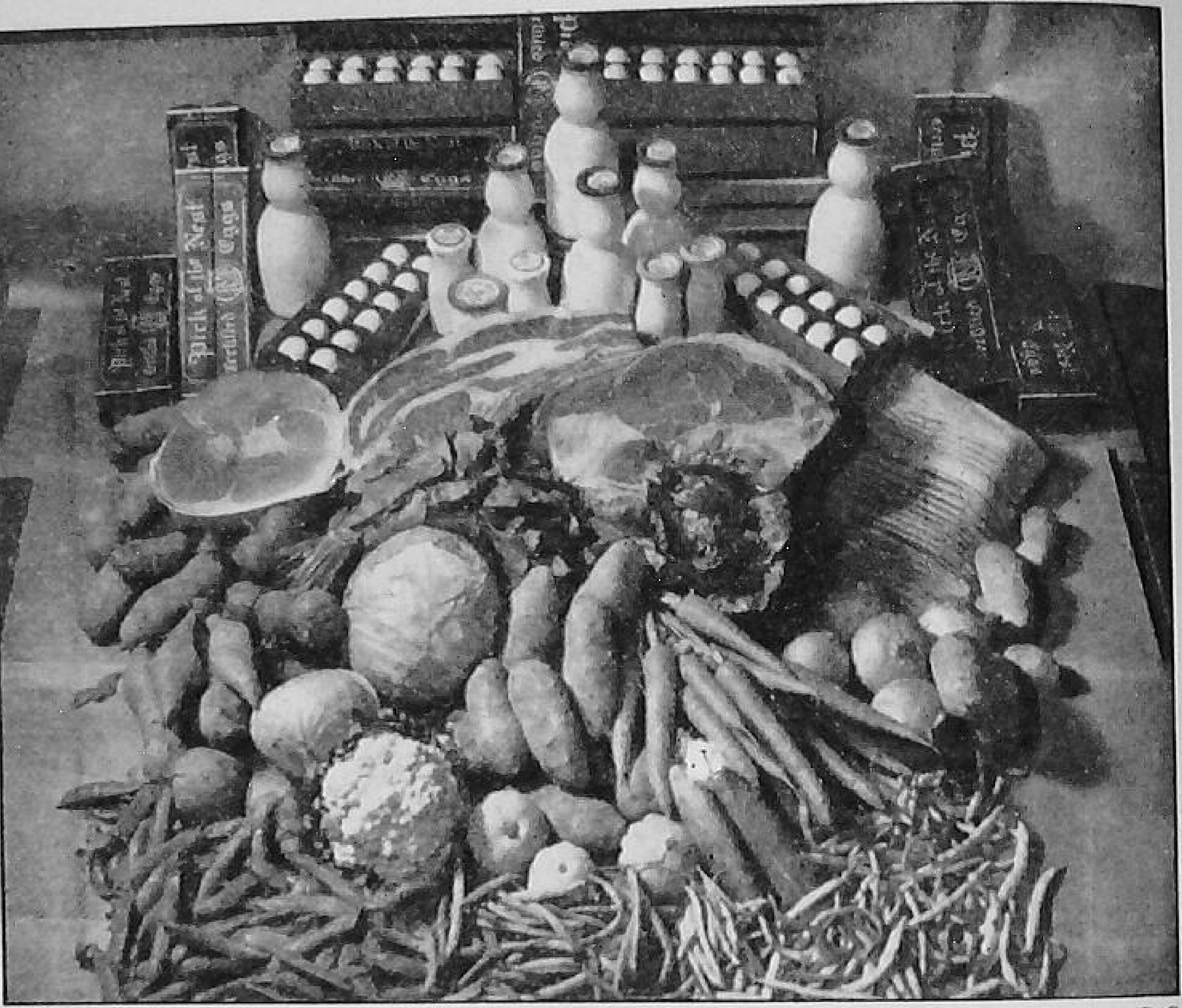
1. Follow all of the procedures given in this problem.
2. Find the totals of all the items on the records of the food intake for the seven-day period.
3. Score your food intake and other dietary practices according to the given food selection score sheet.
4. Make comparisons and draw conclusions on the basis of the findings of the study.
5. Compare your own dietary score with the scores of other class members. Decide how the class rates on food selection.

PROBLEM 7 *How can dietary deficiencies be remedied?*

Deficiencies in one's diet tend to become evident in far more startling ways than merely in the summary figures of one's food intake for a given period. Like Banquo's ghost, in *Macbeth*, they will not down, but persist in mute testimony of injuries done. The anemic girl, iron-starved for a long period of time, bears witness to a dietary lack. The underweight girl who attempts to meet the demands of a current fashion in figures through a drastic control of her calories frequently is unable even to drag through the duties of the day, and in her obvious lack of health bespeaks a dietary deficiency. Quite as bad is the obese girl whose food intake is excessive. The mounting storage of fat indicates even to a person uninformed in the science of nutrition the unbalanced nature of her diet. The sallowness, languor, and dullness of an individual suffering from poor elimination are so familiar that these symptoms are accepted as indicating a faulty and deficient diet.

Ways of correcting deficiencies

The first step in correcting poor food practices lies in the recognition of the unconscious publicity which one's faulty dietary practices receive. Mistakes on paper may seem stupid, but translated into life they are vicious and ugly. No one wants to build and maintain an unattractive, weak structure to house the spirit and mind that are his unique personality. Next is a desire to make a change in one's present nutritional status and practices along with a willingness to exert the effort required to do this. If one is interested in the question of meeting the deficiencies that may exist in dietary practices, and correcting ills already caused by them, a plan of procedure is essential to a successful attack. First in this is the study of one's diet, with a listing of necessary changes. If the caloric intake is too small or too large, if the iron intake is too low, or if bulk is lacking, the proper change should be made. If an abnormal condition has developed, such as anemia, the daily rations must supply the needed constituent in excess of normal requirements in order to correct the deficiency. Further, a person must remember that the condition is not



Courtesy of the United States Department of Agriculture, Washington, D.C.

Fig. 19

Including these "must haves" in the daily diet is essential in correcting dietary deficiencies.

the result of poor food practices for one day, to be cured by correct practice for one day. Consistent practice for a long period may be required. Once the plan is made, it must be followed day by day. For example, between-meal eating can be eliminated only by refusing consistently to eat between meals. If the recognized difficulty is constipation, and a medical examination indicates that it is of dietary origin, the plan of procedure should include increasing the water intake and the bulk in the diet. At least one glassful of water should be drunk upon arising and more water taken freely throughout the day. A regular time for elimination should be chosen and strict adherence to it followed. Laxative foods, that is, foods containing organic acids, gas-forming substances, and cellulose or roughage may be prescribed or indicated. Breakfast should never be omitted.

For anemia of dietary origin, foods high in iron are essential in every meal of the day. Eggs, green vegetables, whole grains, lean beef, and liver are excellent foods to use.

A lack of any mineral should be definitely and regularly made up in the diet. Foods high in the missing element should be purposely eaten. The same is true of the vitamins.

In a dietary plan, as in any other device for developing habits, substitution may be found helpful. If one is unable to forego entirely the "between-meal snack," the substitution of a glass of orange juice or limeade for the customary chocolate bar or chocolate malted milk may reduce the caloric intake. Milk instead of "cokes" will increase the mineral allotment. Fresh apples or dried figs or prunes or carrot and celery sticks may advantageously replace candy.

The importance of following the plan

Even the most carefully made dietary plan may fail if one has no appetite. Poor appetite is real and influences nutrition in many people. It is often associated with a slightly subnormal digestive capacity, which may necessitate between-meal eating. More often it bears a direct relationship to lack of exercise or insufficient sleep. Lack of appetite may be the result of a low intake or lack of iron or of thiamine, vitamin C, or niacin. Faulty elimination also may be a contributing factor to the lag in desire for food. An understanding of body requirements and the means of meeting them needs to be supplemented by attention to the maintenance of normal appetite if the best dietary situation is to be provided.

In the last analysis, meeting the deficiencies in the diet can be done only by conscious, intelligent, and persistent effort. One must care enough about the seemingly remote ends of health to be willing to forego immediate satisfaction of appetite, and one must desire to change his habits. It is sometimes difficult, but it is necessary for a person to decide whether his intelligence or his appetite shall determine his food and other health habits.

ACTIVITIES

1. Class make a comprehensive list of possible results of various dietary deficiencies. Members give examples of results personally known.
2. Decide the extent to which your dietary practices are responsible for your observed dietary deficiencies.
3. Form into groups to discuss the following:
   (*a*) Why do many college girls have poor dietary practices? To what extent are these reasons justifiable? Which reasons are excuses?

(*b*) Why should college students have good dietary practices?

(*c*) What practices of college students may be or may become hazardous to their nutrition and health?

4. Evaluate the following statements:

(*a*) "What I eat is no one's business but my own."

(*b*) "I eat what I want to, when I want to and as much as I want to."

(*c*) "If I don't like a food I don't bother to eat it, no matter where I am."

5. Make a plan for overcoming your own dietary deficiencies and begin to follow it.

REFERENCES

Bogert, L. Jean, *Nutrition and Physical Fitness.* Philadelphia: W. B. Saunders Company, 1954.

Chaney, Margaret S., *Nutrition.* Boston: Houghton Mifflin Company, 1954.

Kilander, Holger Frederick, *Nutrition for Health.* New York: McGraw-Hill Book Company, Inc., 1951.

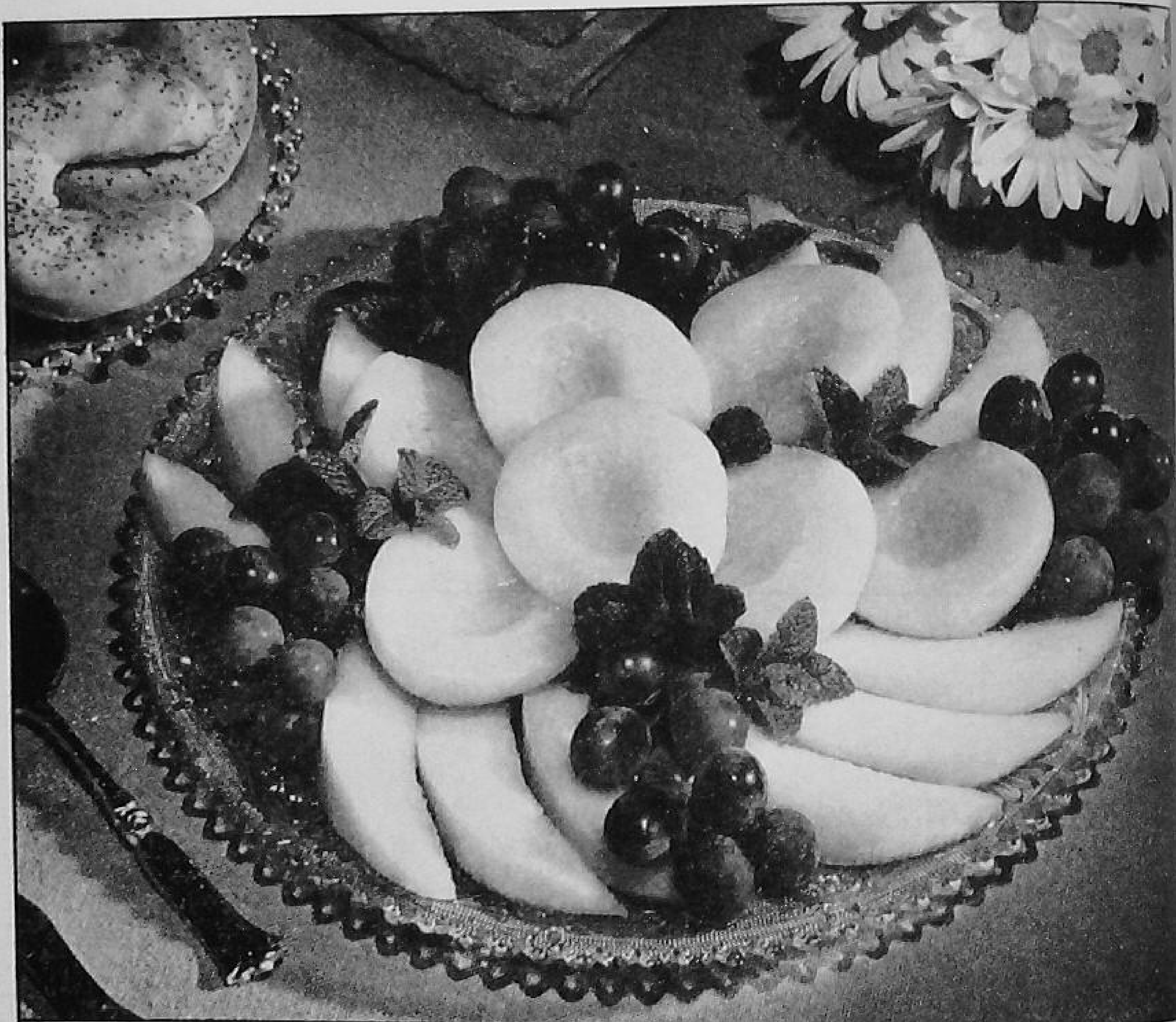
Leverton, Ruth M., *Food Becomes You.* Lincoln: University of Nebraska Press, 1952.

Sweetman, Marion Deyoe and Mackellar, Ingeborg, *Food Selection and Preparation.* New York: John Wiley and Sons, Inc., 1954.

Unit Two

UNIT TWO

The Preparation and Use



Courtesy of California Foods Research Inst

Fruits

FRUITS ARE KNOWN to have been included in the diet of man since prehistoric times, and references to their use and the desire of people for them may be found, like a gay thread, running through the fabric of the religious books as well as the folk legends of all peoples. The story of the forbidden

# of Common Foods

apple in the Garden of Eden and the lamentations of the wandering tribes of Israel when they cried in protest to Moses, "It is no place of seeds or of figs, or of vines, or of pomegranates,"[1] are familiar. It is interesting to note that these early references to fruit include those well known today, such as apples, grapes, pomegranates, berries, and melons.

The importance of these and other fruits in the diets of people throughout the world today is shown in the exchange of fruits in any great city when trade is normal and uncurbed. New York City, for example, receives fruits from all parts of the world, some to be consumed there and others to be shipped to various countries. Its wharfs are centers of activity as great steamers come in laden with bananas from Jamaica, Honduras, or Guatemala; pineapple from Hawaii; dates from Iraq; and lemons from Spain.

An examination of the records of the supply of fresh fruits unloaded in New York City from 1945 to 1949 shows the fruits handled every month of the year and the total carlots unloaded annually to be as follows:[2] apples 7,818, avocados 157, bananas 14,675, grapefruit 4,936, grapes 5,688, lemons 2,644, limes 69, oranges 15,272, pears 3,629, pineapples 1,642, and plantains 311. Although these fruits are available all during the year some of them tend to be seasonal. For example, approximately 50 per cent of the avocados are handled in July, August and September and 60 per cent of the grapes in October and November. Some fruits, available only a few months each year, are handled in considerable quantity as is indicated by an annual unload equivalent of 5,412 carlots of peaches in five months and of 3,661 carlots of cantaloupes in six months. So continually in all parts of the country by water, by rail, and by truck there is

[1] Numbers 20:5.

[2] *Produce Supply Guide, 1950*, United Fresh Fruit and Vegetable Association, Washington 5, D. C.

an exchange of fruit. This has been brought about by the demand for variety.

Classification

Scientifically speaking, the term *fruit* includes a number of foods ordinarily classed as vegetables, nuts, or grains. Most of the foods that are usually listed as fruits are pulpy, in contrast to the legumes, nuts, or grains, which are dry and not generally designated as fruits. This presentation is confined to those products commonly classed on the market and in the diet as fruits. These include apples; peaches; pears; plums; citrus fruits, such as oranges, lemons, and grapefruit; berries of all kinds; melons; bananas; grapes; dates; figs; and others less well known.

The listing of these foods under a single heading, *fruits*, is justified because each has grown from the flower of a plant yielding its ripened seed with some edible adjacent or surrounding tissues. Even casual observa-

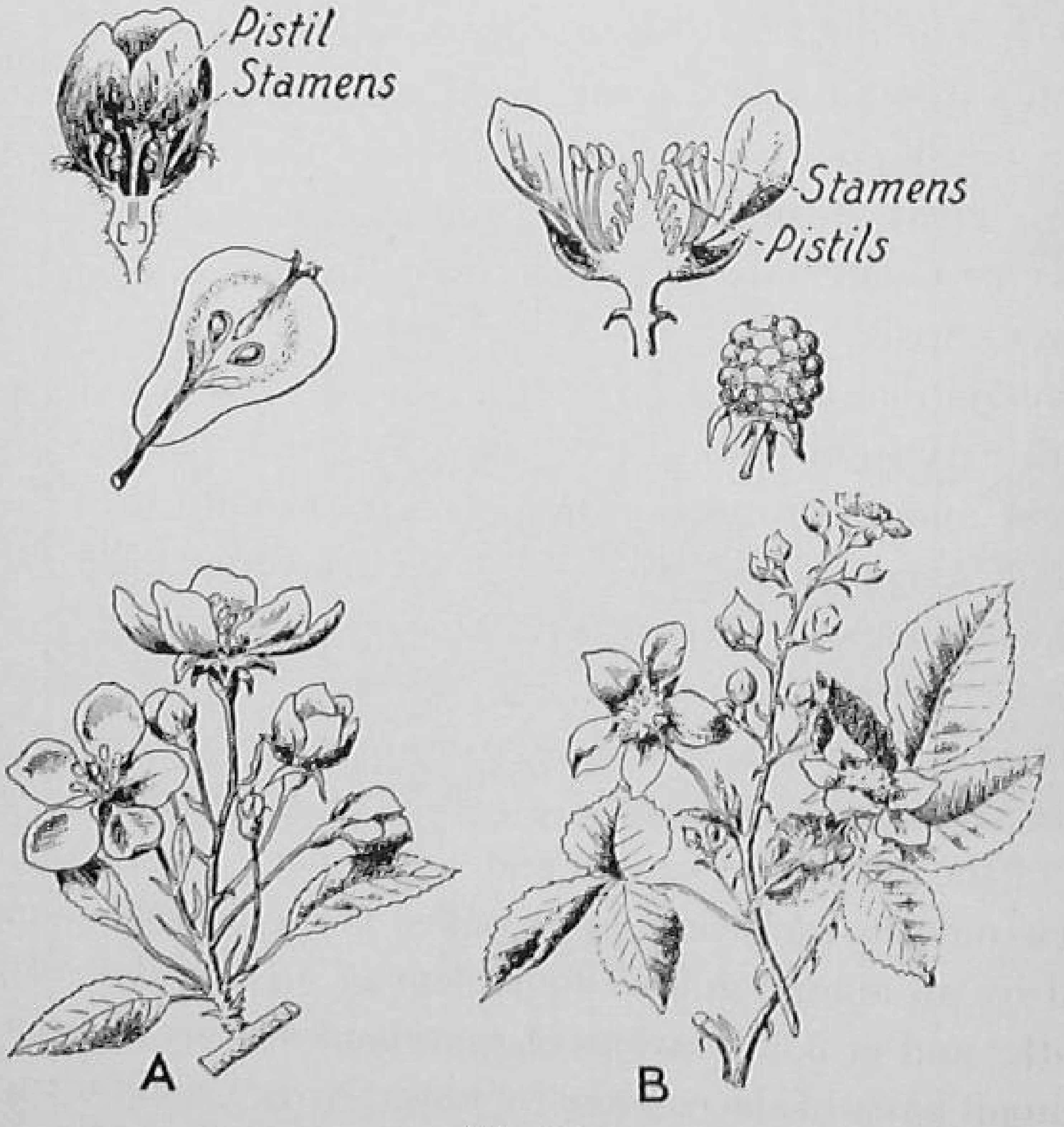


Fig. 20

A simple fruit (*A*) is formed from a flower bearing a single pistil; an aggregate fruit (*B*) from a flower with many pistils.

TABLE 8. CHART SHOWING CLASSIFICATION OF FRUITS

Fleshy							Dry
Simple					Multiple	Aggregate	
Berry	Pepo	Hesperidium	Drupe	Pome			
Cranberry	Cucumber	Orange	Cherry	Apple	Pineapple	Blackberry	Legumes
Blueberry	Squash	Grapefruit	Peach	Pear	Fig	Dewberry	Nuts
Gooseberry	Pumpkin	Lemon	Plum	Quince	Mulberry	Loganberry	Grains
Huckleberry	Muskmelon	Lime	Apricot			Raspberry	
Currant	Watermelon	Tangerine	Nectarine			Strawberry	
Grape		Kumquat	Prune				
Banana			Olive				
Tomato			Coconut*				
Eggplant			Date				

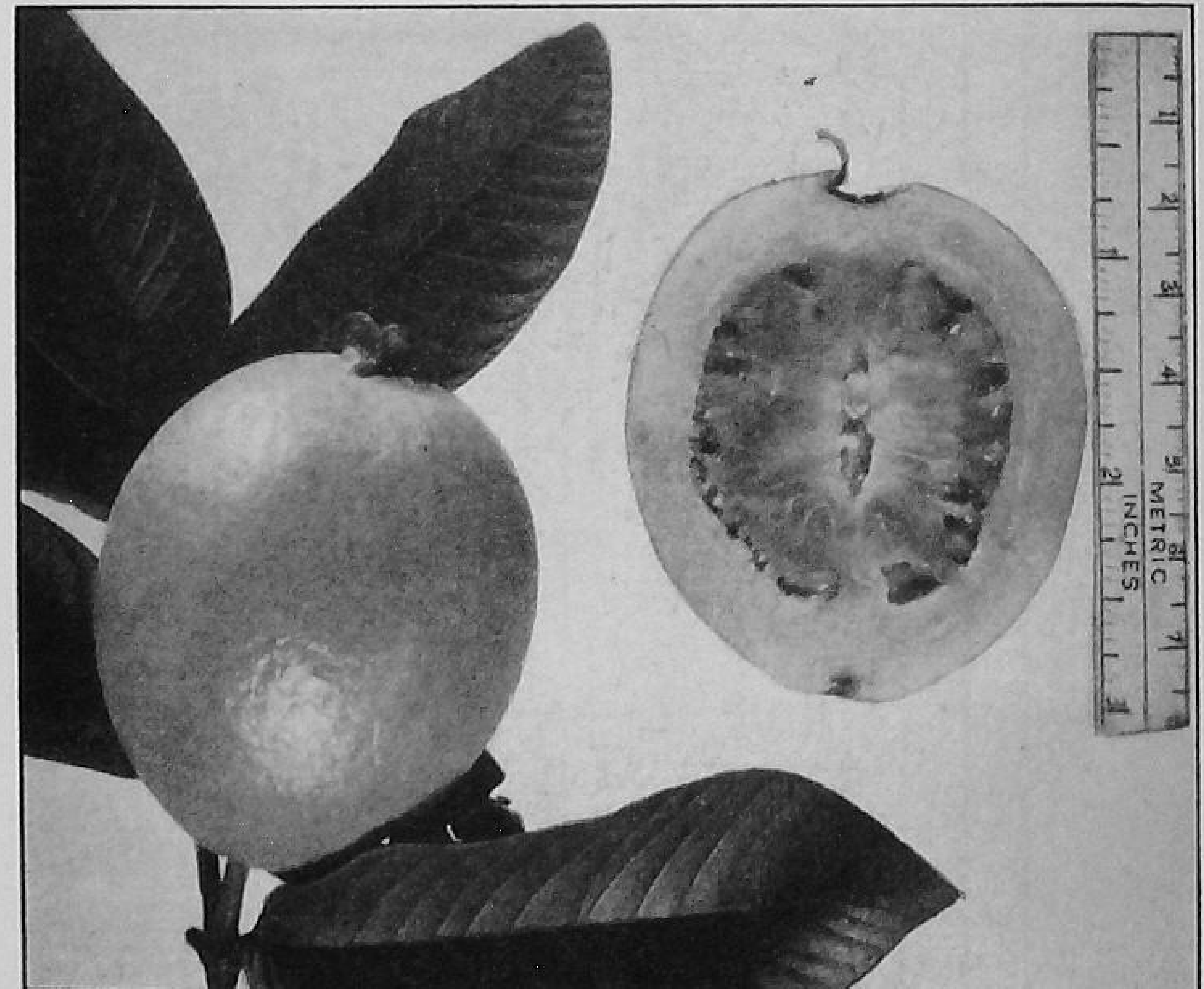
* The coconut is a somewhat modified fruit, the edible portion being a part of the food storage inside the hard seed, often called the endosperm.

tion shows a wide difference in the structure of the various fruits, and leads to an effort to classify them into groups of similar types.

Plants on which the individual bloom is a single flower with one pistil, as in the peach or pear tree, yield a *simple fruit*, consisting of a single enlarged ovary with which some other flower part is often incorporated. This group, of which the plum and the apple are also typical, includes by far the greater number of the common fruits.

The blackberry, typical of the *aggregate fruits*, develops from a flower containing many pistils attached to a dome-shaped stem tip. Each pistil develops as it might in a separate flower, forming a tiny structure similar to a cherry.

The pineapple is typical of the *multiple* or *collective fruits*. This fruit develops from several flowers which consolidate into one mass during



Courtesy of Hawaii Agricultural Experiment Station

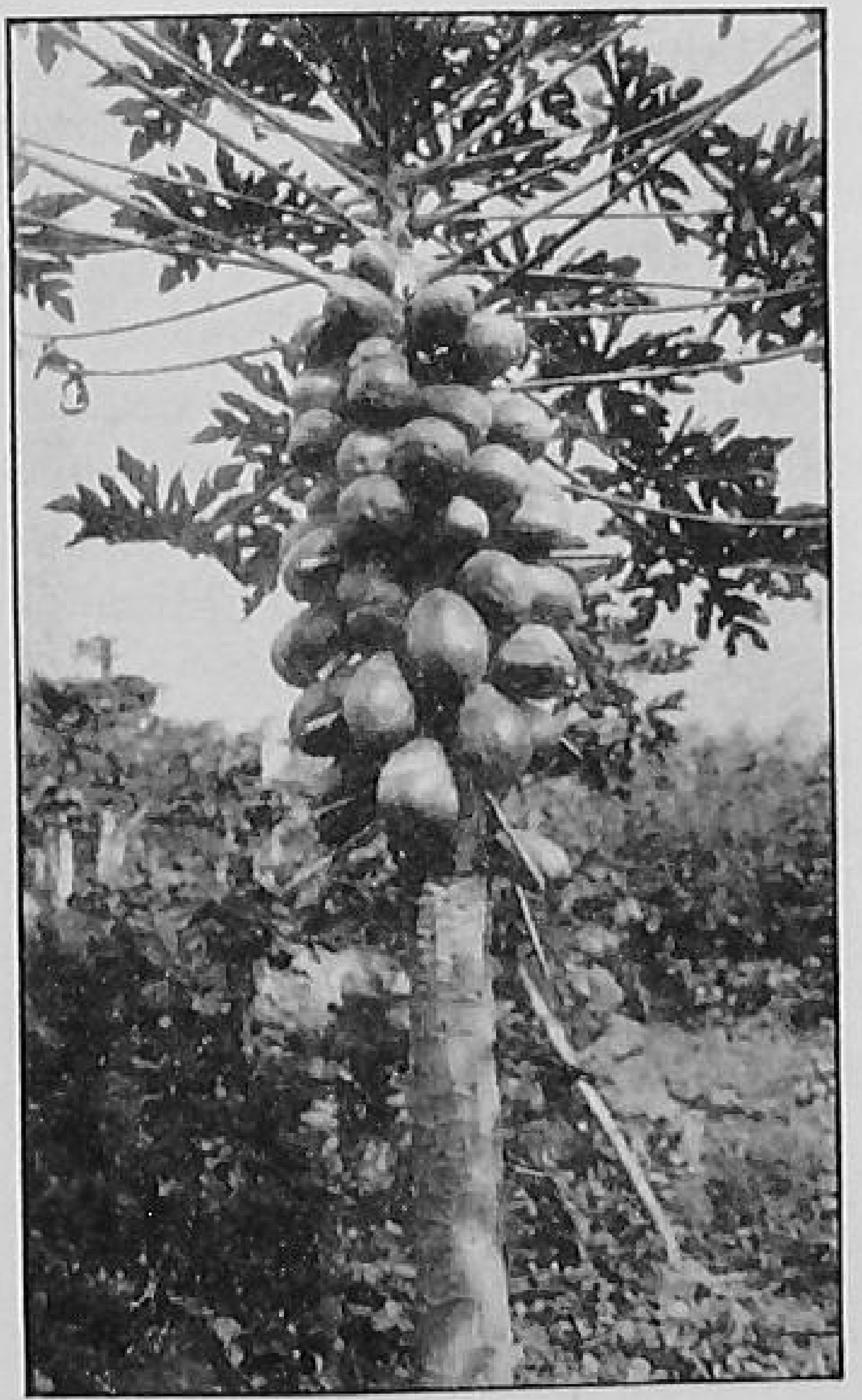
Fig. 21

The common guava is a medium-sized, round or oblong fruit $1\frac{1}{2}$ to 3 inches in diameter, highly prized for jelly making.

ripening. An examination of the pineapple shows it to be made up of many sections joined together. Each of these sections is a developed flower, and each is attached to a center core which has a more or less woody stem structure.

The fleshy fruits are classified not only as the simple, the aggregate, and the multiple, but the simple fruits are further subdivided into five classes: the berry, the pepo, the hesperidium, the drupe, and the pome.

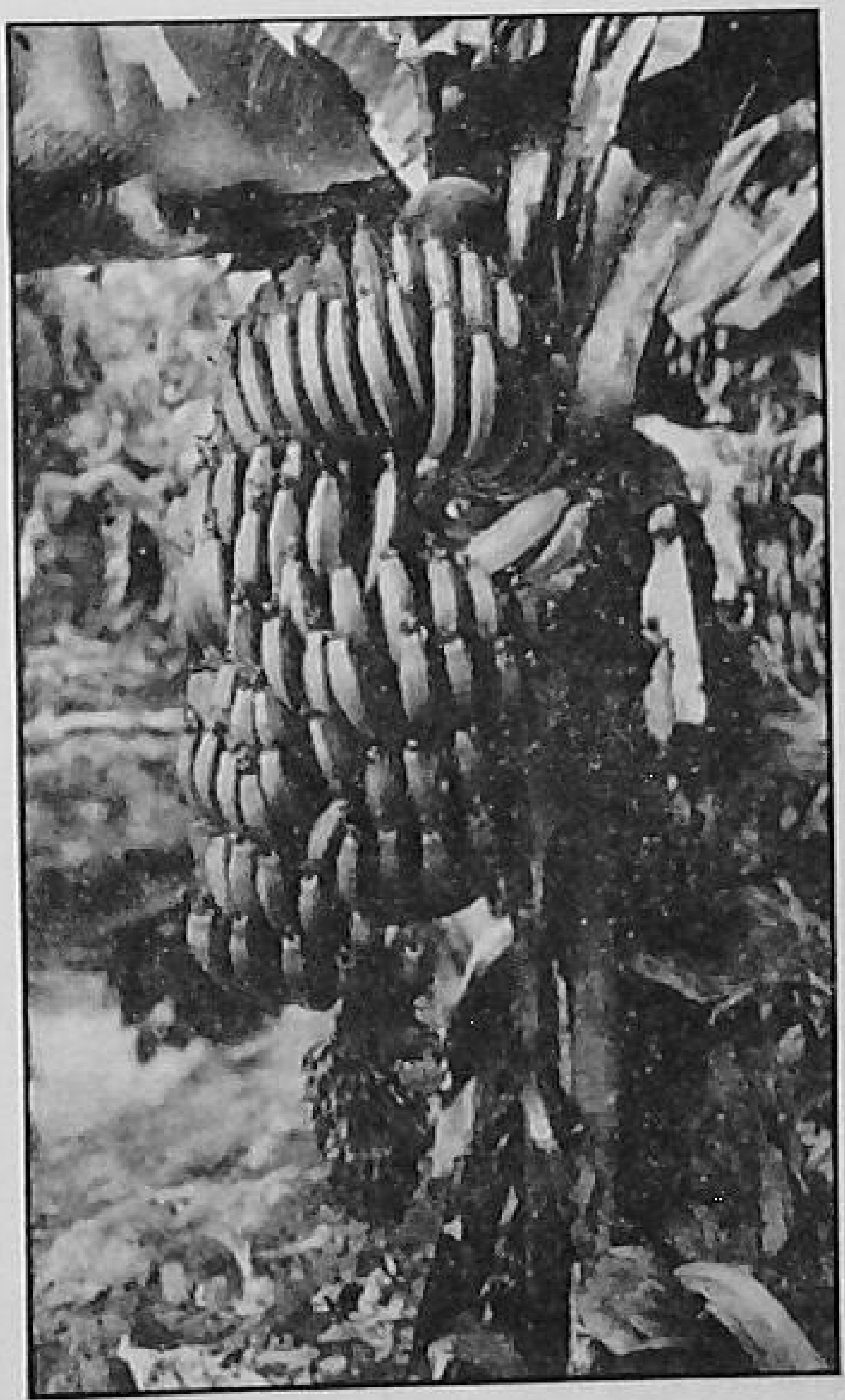
The characteristics of a *berry* are a fleshy ovary wall enclosing, usually, many seeds, though occasionally only one, attached to a fleshy placenta. The gooseberry and the currant are true berries. The *pepo*, the second group of fleshy fruits, is really a type of berry with a hard rind or covering; the cantaloupe is a familiar type. The *hesperidium*, too, is a type of berry,



R. J. Baker

Fig. 22

The papaya, a melonlike fruit with distinctive flavor and aroma, is most often used in the ripe stage as a fruit but the green papaya may be boiled and served as a vegetable.



R. J. Baker

Fig. 23

Bananas grow in a bunch consisting of a number of clusters called "hands," which to the uninitiated, seem to grow upside down.

but with a leathery rind; the orange is a familiar example of this class. The *drupe*, sometimes called a stone fruit, is quite different from the berry. It is composed of a much thickened ovary wall that has an epidermis, often called a peeling or skin, a pulpy central portion known as the flesh, and a hard inner portion enclosing the seed. In most of these fruits the inner hard part of the ovary wall readily breaks loose from the pulpy part, giving what is commonly called the pit. The plum is typical of the drupes.

The *pome* fruits contain "cores." The core or inner paper-like portion is the ovary. Around this and adhering to it are other plant parts that become fleshy as the fruit develops. The apple is a common example of the pomes.

Consumption

According to government reports on estimated consumption of fruits, oranges, apples, bananas, peaches, grapefruit, grapes and pears head the list. Other fruits consumed in significant quantities are lemons, tangerines, plums and prunes, and strawberries, in that order.

Nutritive Value

Table 10 gives the composition of the common fruits. Apparently there is no marked relation between the food value thus shown for a certain fruit and its relative place in the order of production or consumption.

TABLE 9. COMPARISON OF PER CAPITA CONSUMPTION OF SOME FRUITS.*

Fruit	1935–39 Average Pounds	1947–49 Average Pounds	1952 Average Pounds	1953 Average Pounds	1954 Preliminary Report Average Pounds
Fresh — total.....	137.1	130.3	110.5	106.9	102.5
Citrus...........	48.5	53.9	43.6	42.7	40.5
Apples (commercial)	30.2	25.2	21.1	20.1	19.2
Others (excluding melons)........	58.4	51.2	45.8	44.1	42.8
Processed					
Canned fruit......	14.8	18.1	20.6	20.6	19.5
Canned juices.....	3.8	15.9	13.5	13.7	13.1
Frozen (including juices).........	.8	3.2	6.5	7.0	7.3
Dried...........	5.7	4.2	4.2	4.0	4.0

* The National Food Situation, NFS–71, Bureau of Agricultural Economics, United States Department of Agriculture, February, 1955.

A study of the table showing the composition indicates fat to be practically lacking in the common fruits, and the protein and carbohydrate content to be relatively low in comparison with that of most other foods. In the United States emphasis is seldom placed upon the caloric value of fruits. However, in certain sections of the world the date, the coconut, the fig, and the banana comprise the chief source of energy for millions. The energy present is largely supplied by sugar, as indicated by the sweet taste of the fruit. The sugar is in a form that is particularly well utilized by the body.

Fruits and vegetables have long been heralded for the minerals and vitamins they add to the diet. It is estimated that in 1952 fruits and vegetables contributed approximately 9.4 per cent of the calories and 8 per cent of the protein but 12 per cent of the calcium, 21 per cent of the iron, 59 per cent of the vitamin A value, 19 per cent of the thiamine, 12 per cent of the riboflavin, 17 per cent of the niacin, 44 per cent of the folic acid and 92 per cent of the ascorbic acid.[1] Each fruit contributes minerals and vitamins although the kind and amount may vary widely.

Compared with milk, fruits in general are low in calcium, yet the amount of this mineral contained in figs, dates, and raisins is sufficient to be given consideration. Among the fresh fruits oranges, blackberries and grapefruit have an appreciable calcium content. Fruits are an important source of iron. Blackberries and strawberries are particularly rich in this element. Prunes, figs, and dates are also good sources of iron.

One of the most commonly accepted reasons for including fruits in the diet is for their vitamins, a valuable contribution. Most fruits do not contain much vitamin D and only the yellow fruits — as cantaloupes, apricots and peaches — contain a significant amount of vitamin A value. Thiamine and riboflavin are found in fruits in relatively small amounts. Fruits are one of the best sources of ascorbic acid.

On the basis of 1952 prices #200 oranges and frozen orange juice concentrate were two of the three cheapest common sources of ascorbic acid. Only raw cabbage was a more economical source among the foods listed.[2] According to reports published by the National Research Council, it is almost impossible to meet the Council's recommended amounts of as-

[1] Calculated from *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

[2] Attachment. Nutrition Committee News. Jan.–Feb., 1954. Human Nutrition Research Branch, Agricultural Research Service, United States Department of Agriculture.

TABLE 10. NUTRITIVE VALUE OF SERVING-SIZE PORTIONS OF CERTAIN FRESH FRUITS *

Fruit	As Purchased				Edible Portion				
	Measure	Weight	Refuse	Food Energy	Protein	Fat	Carbohydrate	Calcium	Iron
		Grams	Per cent	Calories	Grams	Grams	Grams	Milligrams	Milligrams
Apples (all varieties)	1 medium, 2½ inch diameter	150	12	76	0.4	0.5	19.7	8	0.4
Apricots	3	114	6	54	1.1	.1	13.8	17	.5
Bananas	1 medium, 6 by 1½ inches	150	33	88	1.2	.2	23.	8	.6
Cherries (sour, sweet, hybrid)	1 cup	114	6	65	1.2	.5	15.8	19	.4
Cranberries	1 cup	113	0	54	.5	.8	12.8	16	.7
Figs	3 small, 1½ inch diameter	114	0	90	1.6	.5	22.3	62	.7
Grapefruit	½ medium, 4¼ inch diameter	285	34	75	.9	.4	19.0	41	.4
Grapes (American type)	1 cup	153	22	84	1.7	1.7	17.7	20	.7
Lemons	1 medium, 2¾ by 2 inches	100	38	20	.6	.4	5.4	25	.4
Oranges	1 medium, 3 inch diameter	215	28	70	1.4	.3	17.4	51	.6
Peaches	1 medium	114	12	46	.5	.1	12.0	8	.6
Pears	1 3 by 2½ inch diameter	182	17	95	1.1	.6	23.9	20	.5
Pineapples [1]	1 slice ¾ inch thick, 3½ inch diameter	84	0	44	.3	.2	11.5	13	.3
Plums	1 2 inch diameter	60	5	29	.4	.1	7.4	10	.3
Strawberries [2]	1 cup, capped	149	0	54	1.2	.7	12.4	42	1.2

[1] Figure given for edible portion only; 47% waste as purchased.
[2] Figure given for edible portion only; 4% waste as purchased.
* **Composition of Foods — Raw, Processed, Prepared.** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

corbic acid if citrus fruits or tomatoes are not included in the diet. Apples, bananas, strawberries, cantaloupes and watermelons make important contributions to the American diet because of the quantity consumed in this country. Because of the great variability in the ascorbic acid content of a given fruit, it is impossible to make hard and fast statements regarding the contributions made by any one kind. Research shows that the ascorbic acid content of strawberries, apples, and other fruits varies with the type, exposure to the sun, and other growing conditions. Method of handling after harvest also greatly affects the ascorbic acid content. Frozen fruits change slowly under proper methods of storage. Storage of fresh fruits above 0° C. permits changes to take place and usually results in a lowered ascorbic acid content. Bruising, peeling, cutting into pieces, and exposure to air all make for decrease in ascorbic acid. Peeling apples may result in from 8 to 25 per cent loss of ascorbic acid. Cooking fruits results in loss of ascorbic acid. The loss may easily amount to as much as 25 to 35 per cent for apple sauce and to 80 per cent for apple pie. Hence as vitamin contributors fruits vary greatly, but in general they are more valuable when used uncooked and when they have the minimum of bruising, cutting, and exposure to the air.

If one were to remove all fruit from the diet for a time, it is probable that color and flavor would be missed sooner than minerals or vitamins. Color adds to the attractiveness of the food and is an important part of any appeal to the appetite. Flavor is considered by many as an immediate important contribution made by fruit.

Hence fruit serves as an appetizer. The sight of a large ripe peach or the aroma of a luscious bunch of grapes may cause the mouth to "water." This "watering" of the mouth indicates that the digestive juices have started to flow and that digestion may be expected to begin as soon as the food is eaten.

The flavor of the fruit is due largely to acids, sugar and other substances often referred to as aromatic compounds. Maturity and ripening of the fruit brings about changes until at a certain stage each fruit is considered most desirable for eating. This stage may vary with the use to be made of the fruit and with individual taste, some preferring a firm, tart fruit and others liking it best when softer and sweeter. With the exception of a few fruits, such as bananas and pears, the fruits are of highest quality if ripened before being picked.

During the ripening process the fruit often becomes less acid or sour. This may be due not to an actual decrease in acid content but to an increase of sugars. The starch in the under-ripe fruit changes to sugar, thus

giving a sweet taste which, when combined with the acid present, gives a pleasing taste. At the same time there may be a decrease in the bitter or astringent taste present in under-ripe fruits such as persimmons and the development of the so-called aromatic compounds responsible for the delicious odors typical of many of the most popular fruits. Thus as the stage of ripening reaches the peak, a fruit becomes most acceptable in flavor. It may also become most acceptable in texture for, as a rule, the ripening process results in changing the complex carbohydrate, protopectin, to pectin, a more soluble substance which is important in the making of fruit jelly. If ripening is allowed to continue beyond the optimum stage, there may be loss in quality as the flavor becomes too bland and the texture too soft.

Fruits aid in digestion and elimination by their refreshing flavor, which stimulates the flow of the digestive juices and increases peristalsis, the muscular movement of the alimentary tract. They also aid in a similar fashion by their contribution of that indigestible fiber which is present in every fruit and is at least partly responsible for its characteristic texture. The crispness of some apples, the hard grainy particles in some pears, the rather stringy quality of certain plums, the characteristic small segments and larger sections of oranges, are due to the presence of indigestible fiber and to the nature of its arrangement in each fruit. This fiber, though present in a relatively small proportion, makes possible the retention of the high water content characteristic of fruit. During digestion it tends to absorb more water, thus increasing sufficiently the bulk of the undigested residue in the intestinal tract to stimulate mechanically and to make effective the peristaltic action.

The importance of fruits in the diet is recognized in all statements of the requirements for a good diet. Numerous attempts have been made to arrange food in simple groups to facilitate the planning of meals and the evaluation of the diet. Whether there are five, seven, ten or eleven groups, fruits and vegetables are always included in one or more of these. This is illustrated in the division of the food dollar into five parts, in which "one-fifth, more or less is to be spent for fruits and vegetables." The "Basic Seven," and several other food groupings include "citrus fruits, tomatoes and raw cabbage" in one group and "other fruits and vegetables" in another. Thus it is evident that in any consideration of an adequate diet, fruits are extremely important.

Availability and choice. In pioneer days fresh cultivated fruits of any kind were an unattainable luxury in certain sections of the Middle West. In one part of the country wild sand plums, small, sour, and bitter, were

watched eagerly and picked long before they were ripe, as there were never enough to supply the demand. In another section buffalo berries were the only available fruit. Tiny and tedious to gather, hardly a one was missed. Today, however, even the most isolated community in North America has available fruits from the East, the West, the North, and the South. The improvement of the highways, and the use of motor trucks make it possible for even the small communities to have a constant inflow of fresh foods. Storage facilities have been improved so that the holding of fresh fruit in the small retail store is practical. The harvesting of mature fruits before they are wholly ripened, and the artificial ripening of these as needed, has aided materially in extending the availability of fruit. Unripened fruits keep better than those fully ripened, but there is a definite preference of the consumer for fully ripened fruit. Ripening is accelerated by the use of ethylene gas, which may induce changes in composition, texture, and color. The cost of the gas is low. It is estimated that the cost to ripen a carload of fruit is less than one dollar. The action of the gas destroys the chlorophyll so that the yellow carotinoid pigments or the red anthocyanins, which are not affected, become visible. Some fruits, such as bananas, go through the normal ripening process when treated with ethylene gas. The starch is changed to sugar, the texture becomes mellow, and the color is changed to yellow. On the other hand, cantaloupes treated with this gas change in color only on the surface. The flesh remains hard and flavor is lacking. Research shows that the vitamin content of the fruit is not injured by the gas. It also shows that in many instances ripening on the vine or treeis necessary for maximum development of the vitamins. Hence, fruits picked when they are green tend to be lower in vitamin content, whether ripened in the air or in an atmosphere containing ethylene gas.

In addition to the use of ethylene gas for changing the color of certain citrus fruits which do not normally lose their green color, oranges may be dyed. This is a rather extensive practice, and fruit so treated must be labeled. There is no indication that dyeing destroys vitamins in citrus fruits. However, the Food and Drug Administration recently threatened to ban the coal tar dyes now used. The industry has three years to prove the dyes are harmless for human consumption or to develop and prove a new non-toxic dye.

In addition to improved methods of transportation and storage, the extensive use of the frozen product has no doubt resulted in an increased use of fruit.

The Department of Agriculture reported a per capita consumption of frozen fruits and fruit juices of 0.5 pounds for 1936, 3.11 pounds in 1946,

and 6.53 pounds in 1952.[1] The 1952 consumption data included concentrated fruit juices. When these were converted to a single strength basis the consumption figures rose to 14.34 pounds. When one considers that commercial production of frozen concentrated orange juice started on a small scale in 1945–46,[2] it is amazing to find that in 1952–53 about 46 per cent of the year's crop of oranges was processed into frozen juice. Although frozen fruit is more like the fresh fruit in color, odor, flavor and texture than is any other processed fruit, convenience has undoubtedly played a large part in the increased use of these products. The nutritive value is also well preserved by this method, so that frozen strawberries, like fresh strawberries, are an excellent source of ascorbic acid. Other fruits with high nutritive value in the fresh state will, as a rule, retain it when frozen.

Fresh and frozen fruits, in spite of their increased popularity, have by no means eliminated dried and canned fruits from the diet. These products are widely used by families of all income levels. Drying is one of the simplest and cheapest methods of preserving fruits. Dried fruits are reduced in weight and bulk, they do not require as expensive storage as fresh fruit, they may be kept for long periods, and they are palatable and nourishing. They contribute, with the possible exception of vitamins, every factor found in fresh fruits. The general character of the fruit and the losses in vitamins are dependent upon the method of drying and upon treatment in preparation for this process. Fruits may be dried in the sun or by artificial means as in a forced draft of heated air. This latter method is usually designated by the term dehydration. Vitamin A is better retained by dehydration than by sun-drying. This fact is especially noted in the case of apricots and raisins. However, apricots and dark raisins, as well as peaches, pears, and nectarines continue to be dried in the sun because the resulting color is that to which the buyer is accustomed. On the other hand, bleached or light-colored raisins are always dehydrated, and 80 per cent of the prunes are now dehydrated.

Preliminary to drying, fruits may be lye-dipped and sulfured. Lye-dipping aids in peeling the fruit or makes the peel more tender and sulfuring or treatment with sulfur dioxide is of value in preventing darkening of the fruit. Lye-dipping tends to destroy the vitamin A activity and the ascorbic acid whereas sulfuring is thought to give considerable protection.

[1] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

[2] *National Food Situation*, NFS-68, United States Department of Agriculture, April, 1954.

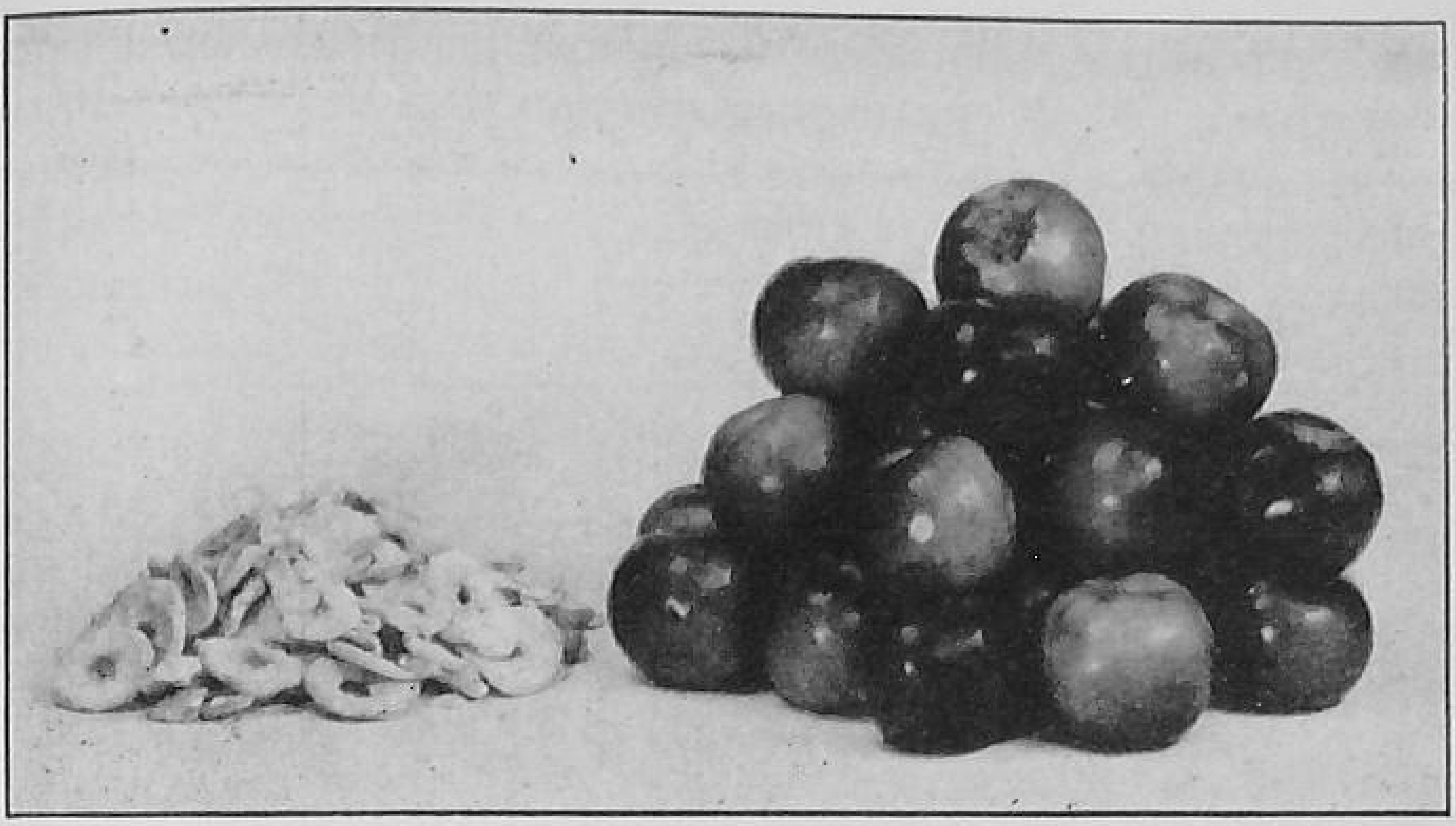


Fig. 24

Fresh apples may be reduced to about one-ninth their original weight when dried; nine pounds of fresh apples yield one pound of dried apples.

This protective action of sulfuring is apparently due to the prevention of oxidation by the reducing action of the sulfurous acid formed. Sulfuring, although protecting the color, the vitamin A activity and the ascorbic acid, decreases the thiamine activity. The amount of sulfur which may be left in the fruit is carefully regulated by law. When only a small amount is left, it is volatilized during cooking.

The relation of dried to fresh fruit is shown in Table 11 and the composition of dried fruits in Table 12. Fruits that have been slightly precooked

TABLE 11. RELATION OF FRESH TO DRIED FRUIT*

Fruit	Quantity of Fruit Dried	Yield of Dried Fruit	Number of Servings of Cooked Dried Fruit
Apples......	6–9 pounds	1 pound	25 servings, ⅓ cup fruit plus juice
Apricots.....	5½ pounds	1 pound	10 servings, ⅓ cup fruit plus juice
Figs........	3 pounds	1 pound	12 servings, 5 figs plus juice
Peaches.....	5½ pounds	1 pound	11 servings, 3 peach halves plus juice
Pears.......	3 pounds	1 pound	9 servings, 3 pear halves plus juice
Prunes......	3 pounds	1 pound	10 servings, 6 prunes plus juice
Raisins......	3½ pounds	1 pound	9 servings, ⅓ cup fruit plus juice

* Adapted from "The Story of Dried Fruits with Cookery Lesson" published by California Dried Fruit Research Institute, 1 Drumm Street, San Francisco, 1938.

TABLE 12. NUTRITIVE VALUE IN ONE CUP OF CERTAIN COMMON DRIED FRUITS *

Dried Fruit	Weight 1 cup Grams	Food Energy Calories	Protein Grams	Fat Grams	Carbo-hydrate Grams	Calcium Milli-grams	Iron Milli-grams
Apples	114	315	1.6	1.1	83.4	22	1.6
Apricots	162	423	8.4	.6	108.4	139	7.9
Dates	178	505	3.9	1.1	134.2	128	3.7
Figs	168	453	6.7	2.0	114.9	312	5.0
Peaches	160	424	4.8	1.0	111.0	70	11.0
Prunes, medium[1]	165	375	3.2	.8	99.4	76	5.5
Raisins (seeded & seedless)	160	429	3.7	.8	113.9	125	5.3

[1] 15 per cent refuse.

* **Composition of Foods — Raw, Processed, Prepared.** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

after drying are known as "tenderized" dried fruits. The fact that moisture has been added is stated on the package. "Tenderized" prunes have a moisture content of about 30 per cent.

Home and commercial canning of fruits makes possible a readily available year-round supply. Canned fruits commonly found on the market include a variety of juices, and whole, halved, sliced and diced fruits. Commercially canned fruits are usually packed in syrup; however, some are packed in water and others are pickled. Canning factories are located close to the supply of fruit, making it possible to can the food while fresh and at peak flavor.

Although differing in flavor and texture from fresh fruits, canned fruits are palatable, wholesome, and high in food value. Studies indicate that, in some instances at least, commercially canned foods are higher in ascorbic acid than are the same foods after long storage as fresh fruits. Canned fruits, as well as dried, are often economical, for their preparation offers an inexpensive means of preserving the excess fruit of the nation as well as that of the home. Unlike dried fruits, however, canned fruits have greater weight and bulk than fresh fruits. One ton of fresh fruit, if canned, may weigh 2800 pounds, and if dried, only 450 pounds.

PROBLEM 1 *How shall fruit be prepared?*

For many people the enjoyment of a meal, especially breakfast, depends upon the availability of a certain fruit. In almost every season several fruits are available at reasonable cost. The likes or dislikes of a person may determine which fruit is chosen. Other factors that may affect the choice are the keeping quality and the food value of the fruit.

Procedures for raw fruit

Most fresh fruits when thoroughly ripe are suitable for serving raw. This method insures obtaining the full value of the fruit without the loss, through cooking, of such nutrients as ascorbic acid. All fresh fruits should be thoroughly washed before serving, since growing fruit collects dust and the ever-present microorganisms. Often, too, sprays of various types, some of them highly poisonous, have been used to prevent spoilage by fungi and insects. The possible harmful results of using fruit so sprayed has led to the development of washing machines for the purpose of cleansing the larger fruits before they are put on the market. Even when all spray material has been removed by washing, contamination with dirt and bacteria may result later from carelessness on the part of the packers in the handling of the fruit or on the part of merchants in marketing it. Hence, disease or illness sometimes follows careless preparation of fruit served raw. Thorough washing is often the only preparation necessary for fruit. Frequently, however, fruit to be served raw is chilled after washing.

A number of fruits darken rapidly when cut because of the action of oxidizing enzymes on tannins and other compounds. Citrus fruit juices and pineapple juice are helpful in protecting against this discoloration. More recently the use of various chemicals has proved to be effective in varying degrees. One of the most effective is ascorbic acid. Aside from protection against darkening, the ascorbic acid may contribute nutritive value when the fruits are handled carefully to prevent excess oxidation.

Procedures for cooked fruit

Sometimes it is desirable to cook fruit to obtain variety, to develop its palatability, to increase its keeping quality, to add interest, to soften cellulose, or to cook the starch. Green apples, for example, are much improved

Courtesy of California Foods Research Institute

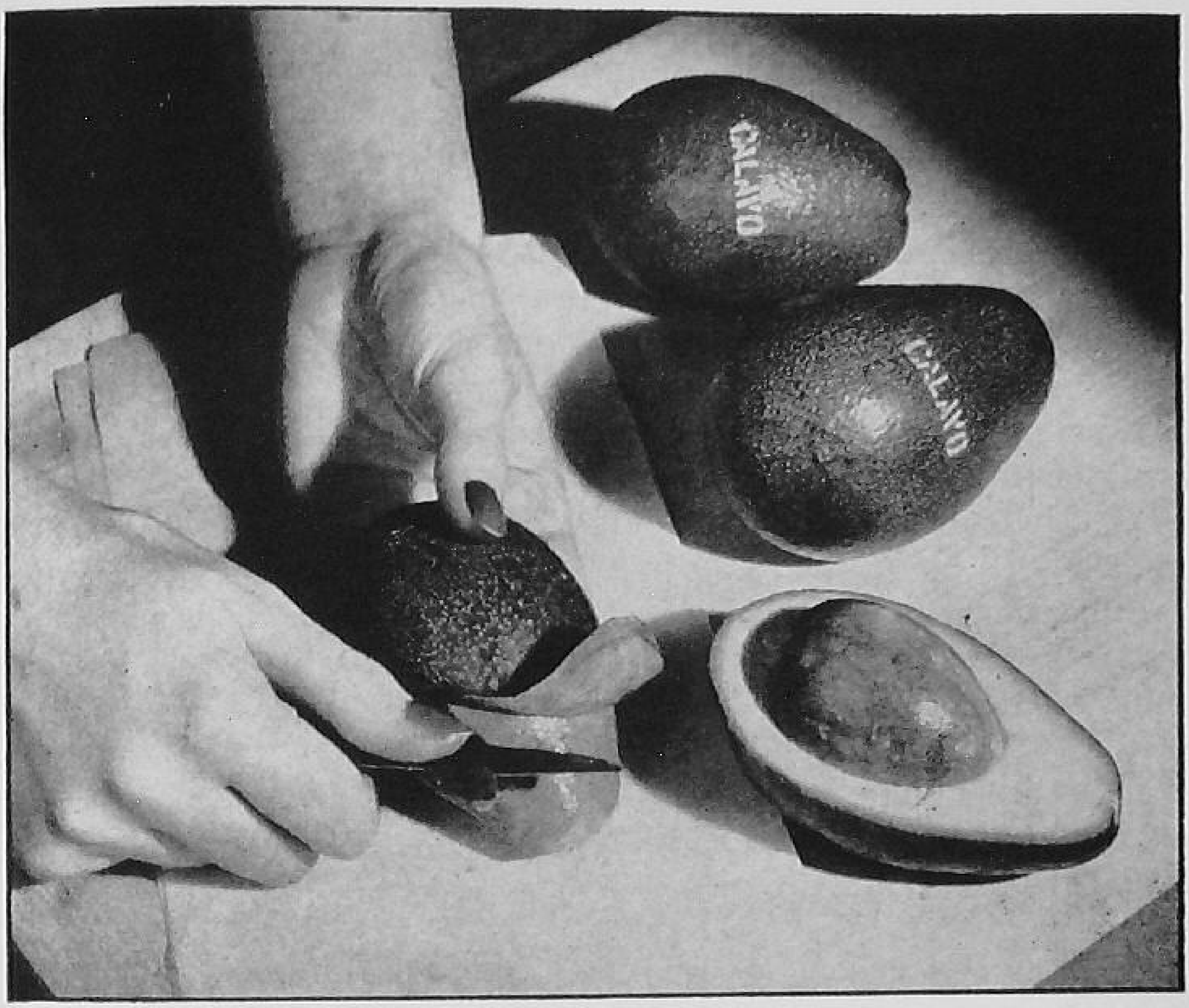
Fig. 25

Preparing Hawaiian pineapple: With a large knife, cut slice off bottom of pineapple. Cut away rind from top to bottom. With small knife, cut diagonal grooves to remove "eyes." Cut pineapple in crosswise slices, or cut lengthwise into wedges, removing hard center core.

by cooking. Strawberries and other highly perishable fruits may be kept several days longer if cooked.

The method of cooking the fruit is determined by the character of the product desired, although the variety of the fruit may be as important as the method of cooking. Through experimental work, the effect of the method of preparation has been determined and procedures have been set up by which a standard product of the desired form can be obtained.

If a sauce is desired, the fruit is stewed. If one wishes the fruit to remain whole it may be baked, or it may be carefully cooked in a syrup without stirring, as in a compote. In general, fruits are softer when they are cooked in water than when cooked in syrup. When it is desired that certain fruits retain their shape during cooking, the sugar is added at the



Courtesy of California Foods Research Institute

Fig. 26

Here's how to peel an avocado. It's easy to pull the thin flexible skin from the smooth meat of the fruit. Don't attempt to peel the whole fruit unless it's to be served in that form. Instead, pull the skin smoothly from halves, thirds, quarter sections or slices after the required section is cut from the fruit. Only very thin slices are an exception to this rule.

first. This can be done by adding it directly to the fruit or by cooking the fruit in a syrup. If the sugar concentration is about the same as the concentration of the soluble materials in the fruit, the fruit tends to hold its shape. When the sugar concentration is higher, the water is withdrawn from the fruit by osmosis and the fruit shrinks and is toughened. With a hard fruit like the Keifer pear the hardening may proceed to such an extent as to be undesirable, even when a small amount of sugar is used. With such fruits the sugar is added after a preliminary cooking in water. Other fruits like strawberries and seeded sour cherries may collapse or flatten when put in a syrup at the beginning of the cooking period.

Whether the sugar affects the hemicellulose or the pectin is unknown. The original shape of fruit can be better maintained by cooking carefully in a covered utensil. The steam is thus retained and aids in the cooking. Water boiling rapidly shakes the fruit around and breaks it into pieces. It also causes the escape of the more volatile compounds which are responsible for some of the flavor. Slowly boiling water tends to break the fruit less. In general, a short cooking time in a small amount of water in a deep, well-covered utensil, and with the minimum of sugar, favors the maximum retention of both natural flavor and nutritive value.

When fruit is baked, a covered utensil may or may not be used. If covered, the fruit retains its shape better but does not brown. However, the cover may be removed and the fruit browned for a few minutes in a broiling oven.

Although stewing and baking are the most common methods of cooking fruit, others are used more or less frequently. Apples, bananas, and other fruits are fried. Bananas and pineapples are among those prepared by broiling.

Even though the same procedure is followed in preparing several different kinds of fruits or several varieties of the same fruit, the structure, the stage of ripeness, and the degree of freshness determine the time necessary for cooking.

The character of the product is affected by the proportion of sugar to fruit. For fruits such as cherries or peaches, an increase in the amount of sugar results in products of markedly differing character, ranging from sauce to compote to preserve, as the ratio of sugar increases. Though the nature of the fruit and its condition determine the amount of sugar necessary to yield the desired product, the proportions given in Table 14 are usually found satisfactory.

The nature of the dish also depends upon the type of fruit being cooked. When cooked, a juicy fruit, such as strawberries, will have a consistency quite different from that of a firm fruit such as Jonathan apples. Even different varieties of the same fruit, such as apples, have different cooking qualities. Some cook readily to a mush in water, and others hold their shape even after long cooking. These qualities seem largely to result from the differences in the quantity and form of the cellulose, hemicellulose, and protopectin or pectin present. The cell walls in fruit tissue are complex, consisting of cellulose, protopectin, and hemicellulose. It seems probable that the nature of the pectin-like substances, whether or not protopectin has been changed to pectin, or whether it is largely in the form of calcium pectate, has much to do with the softening and disintegration

TABLE 13. APPROXIMATE TIME REQUIRED FOR COOKING VARIOUS FRUIT PRODUCTS

Fruit	Sauce	Baked	Compote
Apples	10 min.	45–60 min.	20–30 min.
Bananas	....	20–25 min.	....
Cherries	10 min.	....	....
Peaches	10 min.	30–60 min.	15–25 min.
Pears, Soft	10–30 min.	25 min.	20–60 min.
Pears, Hard	1¼ hrs.	1½ hrs.	....
Plums	10 min.	....	20–25 min.

TABLE 14. PROPORTION OF SUGAR TO FRUIT FOR SAUCES, COMPOTES, AND PRESERVES

Fruit	Sauce	Compote	Preserves
Apples, 2 lbs.	½–1 cup	1–2 cups	3 cups
Cherries, 2 lbs.	1 cup	....	4 cups
Peaches, 2 lbs.	1⅓ cups	1½–3 cups	4 cups
Pears, 2 lbs.	1 cup	1½–3 cups	4 cups
Plums, 2 lbs.	1 cup	1½–3 cups	4 cups

of fruit. Calcium pectate dissolves with difficulty or not at all, so that when it is present in considerable quantity, the fruit retains its shape. Large amounts of cellulose and hemicellulose also tend to prevent softening, but this is probably more evident in vegetables than in fruits.

Further variety in fruit dishes may be obtained by varying the ingredients used. For example, apples may be baked in a plain sugar syrup, or in one made with brown or maple sugar. They may be stuffed with nuts, raisins, or other dried fruits. They may be baked in a sauce made of sugar, water, flour, and butter. They may be seasoned with spices of various kinds. Though apples are the basis of each of these dishes, variety is obtained through the other ingredients used.

Fruits lose little or no food value in preparation from the dissolving out of nutrients, for the juice or liquid in which the fruit is cooked is so palatable that there is no temptation to discard it. To many, it is even more tempting than the fruit itself. There is, however, some destruction of vitamins in fruit cookery, as previously explained.

Preparing dried fruit

The preparation of dried fruit is slightly different from that of fresh. This process is usually divided into three steps: washing, soaking, and cooking slowly in the water in which it was soaked. Washing is desirable for all dried fruits except those purchased in sterilized packages. Dried fruit has had a large percentage of its original moisture content removed. Soaking of the firmer fruits, like apricots, peaches, and prunes restores the moisture, and the fruit becomes plump and somewhat tender. Softer fruits like dates, raisins, and figs do not require soaking. Long soaking in cold water is thought to give a watery, tasteless product and not to improve the cooking quality. The fruit after being soaked about an hour or until well plumped in hot water requires only a short time for cooking and is usually more attractive in appearance than that soaked for a long period. Adding the sugar for only the last five minutes of the cooking period is considered desirable. Adding sugar before cooking affects the ability of the fruit to absorb moisture and thus delays the tendering process. When cooking tenderized dried fruits, the cooking time may be shortened. Ordinary bulk dried prunes may require thirty-five to forty minutes, while "tenderized" prunes may cook in ten minutes.

Dried fruits have a great variety of uses. They may be simply cooked and used as a sauce; they may be made into pies; used in puddings, cookies, cakes, candies, breads, marmalades; sieved and used in whips; or they may be used in any number of other desserts.

Preparing frozen fruit

Frozen fruit may or may not be already sweetened. It may be whole, sliced, or crushed, depending upon the treatment previous to freezing. The fruit should be thawed just before using. As a rule, the thawed fruit is less firm than when fresh. This is probably responsible for the recommendation that such fruits as peaches, strawberries and raspberries be used when still slightly frozen if they are not to be cooked. Frozen fruits are used as sauces, over ice cream, in frozen desserts, in the making of jams and preserves, in pies, and in other dishes where fresh fruits are used.

Service. Fruits should be attractively served. Oranges, though frequently served for breakfast, are not always appetizing. Often they are carelessly peeled, with much of the white of the skin remaining, and torn into uneven sections, or roughly cut into slices. However, they may be cut with sharp edges and uniform shape, and carefully arranged around a mound of powdered sugar, or they may be made into orange juice and chilled to just the right degree. Similar variation is noted in other fruits.

Each tempts or repels. For many fruits powdered sugar is more desirable than granulated. Its snowy white color is a contrast to the color of the fruit and it dissolves more readily. A bit of garnish or an unusual serving dish may help make the fruit more appealing. Candied or maraschino cherries or colored raisins add interest. Temperature is an important consideration in serving fruit. When served cold, it should be thoroughly chilled. Servings should be adequate but not too large. A huge serving of almost any food detracts from its desirability.

ACTIVITIES

1. Make a chart showing the availability of fresh fruits in your locality during the various seasons.
2. Compare the cost per serving of the fresh, frozen, and dried fruits now on the market locally.
3. Compare fresh, frozen and canned juices as to appearance, cost, flavor and convenience. Grape juice, orange juice and grapefruit juice may be used.
4. Prepare and evaluate fruits to be served raw, using fresh or frozen fruit, selected from among the following:
   - Sliced oranges
   - One half grapefruit
   - Sections of oranges and grapefruit
   - Pineapple points
   - Japanese persimmons
   - Fruit cocktail
   - Melon balls
   - Frosted grapes
   - Shredded wheat with fresh peaches
   - Puffed rice with fresh strawberries
   - Strawberry shortcake
   - Cottage pudding with fresh raspberry sauce
   - Coconut blanc mange with fresh peach sauce
   - Gelatin jellies with fresh fruits
   - Snows, whips, fluffs, and Bavarian creams, using egg white, gelatin, or whipped cream and fresh fruit, *e.g.* banana fluff, lemon snow, orange Bavarian cream
   - Ices, frappés, and sherbets as grape ice, lemon frappé, orange sherbet
5. Prepare and compare different varieties of apples common in your area. Cook in water and in sugar syrup. Cook in covered and uncovered saucepans.
6. Prepare and evaluate cooked fruit selected from among the following:
   - Apple sauce, from fresh, frozen, dried, or dehydrated apples
   - Apple ball sauce
   - Cranberry sauce

Stewed rhubarb
Stewed prunes, dried peaches, or dried apricots
Baked pear
Stuffed baked apple
Baked bananas
Baked dried figs
Broiled bananas
Fried apples
Spiced apple rings
Apple compote
Cranberry jelly
Apple snow
Prune whip
Apple tapioca
Cherry tapioca
Brown Betty
Fruit pies or tarts

Refer to Department of Foods and Nutrition, Kansas State College, *Practical Cookery and the Etiquette and Service of the Table*, Twenty-second Edition (New York: John Wiley and Sons, Inc., 1956), "Fruits," pp. 35–40; Marjorie Heseltine and Ula M. Dow, *The Basic Cook Book*, Boston: Houghton Mifflin Company, 1956, "Fruits," pp. 60–75. Consult the indexes for whips, tapiocas, ices, etc. Recipes not included in these references are to be supplied by the instructor.

Cereals and Cereal Products

From earliest time grain has been man's chief means of subsistence. So important was its production that the ancient peoples of many lands believed that the protection of the grain was the primary concern of one of the most powerful goddesses. From the name Ceres, given by the Romans to the goddess who was protectress of grain, the term cereals, now so widely used, was derived. As indicated by its derivation, the term in a broad sense includes those plants belonging to the grass family which produce grains or farinaceous seeds, the grains themselves, and it has now been extended to cover the food products from these grains.

The importance of the foods included in this group is indicated by the part cereals have played and continue to play in world affairs. According to both myth and history the earliest civilizations were founded upon the

growing of cereals, and since that time the influence of cereal production has been constantly felt.

On each continent there is a wide geographic area well adapted to the growth of one or more of the cereals. The golden ripple of broad fields of ripened wheat is well known in Russia, Canada, Argentina, and the United States. Tasseling corn may be seen in South America, Mexico, and the United States, while the domain of rice stretches from China, India, and Japan to the southern portion of our own country. The student of world history finds much of interest and romance in the effect of the discovery of the adaptability of certain grains to new areas or that of changes in the processes of cultivation on the affairs of nations. An illustration sometimes given is that the discovery of the adaptability of rye to Northern Europe led to the development of that territory, with an attendant marked increase in the population and power of those peoples. The invention of the reaper, the binder, the header, the tractor, and the combined harvester-thresher has definitely affected the production of cereals. The cost of production varies widely with the different grains, depending upon the cultivation necessary, the machinery used, and the resultant yield. It also varies for any one specific cereal with the methods used and with the standards of living prevailing among the workers.

The influence of cereals in world history is merely a reflection of their importance in the daily life of people. While "man shall not live by bread alone," bread and other cereal products have remained throughout the centuries the chief articles of diet in most countries, although today the consumption of cereals and cereal products in this country is far below that of a half century ago.

Nutritive value. Cereals are excellent sources of energy. Starch, the valuable energy food, makes up about three fourths of any cereal. Protein, the tissue-building food, although less abundant, is present in significant amounts, composing about one eighth of the grain. Generally speaking, the proteins, though well utilized by the body, may be inadequate or incomplete. Body tissues cannot always be built efficiently from these alone. When properly supplemented by those in milk, eggs, or meat, the proteins in cereals may largely meet the body's requirements. The fat found in the grain, which varies in amount from 1/100 to 4/100 parts, is present mostly in the germ or embryo. This part, together with the outer covering, also contains the greater portion of the minerals and vitamins of the grain. The phosphorus content of the whole grains is relatively high, but the calcium is uniformly low. The amount of iron varies widely. The nutrients in certain cereals are presented in Table 15.

TABLE 15. NUTRITIVE VALUE IN ONE CUP OF SELECTED CEREAL PRODUCTS*

Cereal Product	Weight of 1 cup Grams	Food Energy Calories	Protein Grams	Fat Grams	Carbo-hydrate Grams	Cal-cium Milli-grams	Iron Milli-grams
Cornmeal, yellow (new process)	145	527	11.5	1.7	113.7	9	1.6
Oatmeal	80	312	11.4	5.9	54.6	42	3.6
Rice (milled)	191	692	14.5	.6	151.7	46	1.5
Rye flour (light)	80	285	7.5	.8	62.3	18	.9
Wheat flour (whole wheat)	120	400	16.0	2.4	85.2	49	4.0
Wheat flour (patent bread)	112	408	13.2	1.2	83.7	18	1.0

* **Composition of Foods — Raw, Processed, Prepared**, Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

These figures cover the grains most used. Foods manufactured from them obviously have similar food values in so far as the grains enumerated appear in such products. Grains contain generous amounts of thiamine but are relatively less rich in riboflavin. The germ of wheat is an abundant source of vitamin E. Cereals in general are deficient in vitamin A value, vitamin D and ascorbic acid, although yellow corn contains a significant amount of vitamin A and sprouting cereals contain ascorbic acid.

The contribution of cereals to the American dietary is shown by the fact that even though the consumption of cereals has dropped during recent years, in 1952 they supplied approximately 22.8 per cent of the total calories. The high nutritive value of cereals is accompanied, in general, by a flavor both bland and agreeable. This makes possible their continuous use in the diet without the distaste which might accompany similar use of a more highly flavored food.

Cereals play an especially important part in the low-cost diet. The Bureau of Human Nutrition and Home Economics has suggested the per capita allowance of cereals and cereal products at different cost levels. This allowance is three pounds four ounces per week for a moderately active woman on a low-cost food plan or 169 pounds annually. In the master food plan at moderate cost 126 pounds are recommended. For a physically active man the recommendation is 221 pounds annually for the low-cost food plan and for the moderate-cost 195 pounds.[1]

[1] *Helping Families Plan Food Budgets*, Miscellaneous Publication No. 662, United States Department of Agriculture, 1952.

The value of cereal products in the low-cost food plan is readily understood when the cheapest sources of calories are considered. These are lard, sugar, degermed enriched cornmeal and enriched wheat flour. Lard contributes calories and essential fatty acids and sugar only calories while the two grain products are among the cheapest sources of thiamine, riboflavin, niacin, protein and iron.[1] The average per capita consumption of cereal products in the United States in 1952 was estimated to be 163 pounds.[2]

Structure of grain. The kernels of cereals used as food are actually the dry fruits of the grasses. In the grain fruit, the thin ovary walls adhere to the seed and the whole structure appears to be the seed. Though each of these kernels has a characteristic structure which markedly affects the manufacture of cereal products, there is a great similarity among them. Because of this fact the wheat kernel may be considered as typical of the group. Although there are many parts to the grain, only three major divisions, counterparts of which are found in all grains, will be considered here. The bran or outer covering of the grain is actually composed of several layers. It contains considerable amounts of cellulose, minerals, protein, and a small amount of thiamine. This layer serves as a protection for the fundamental portions of the grain.

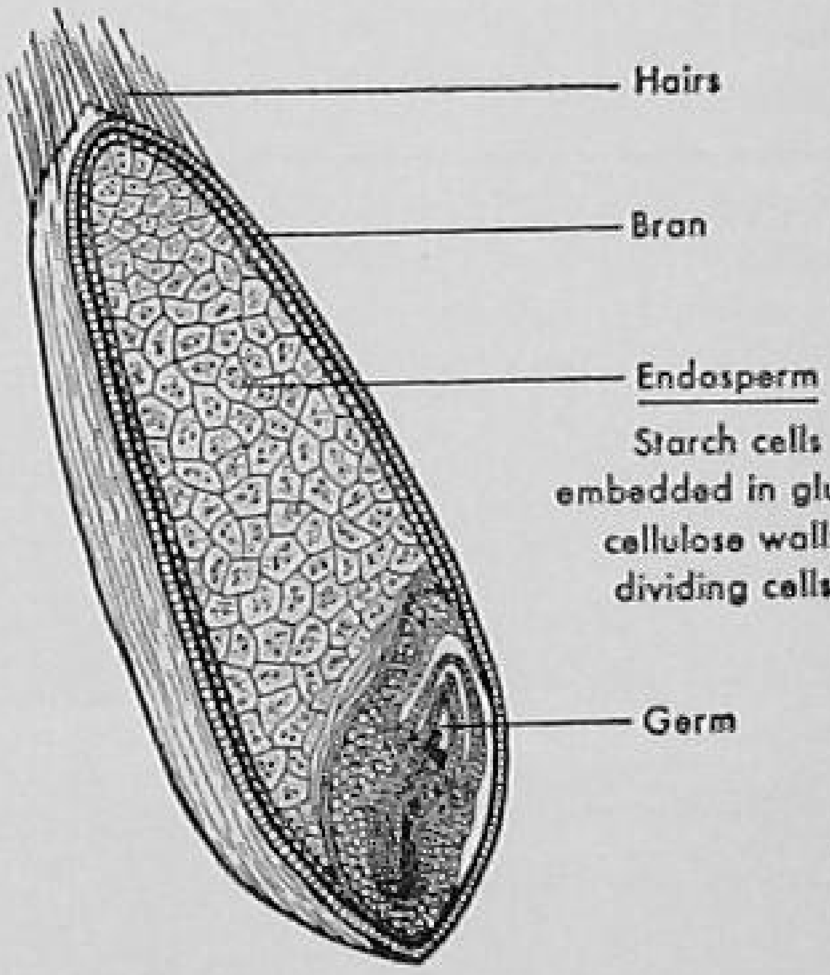


Fig. 27

The wheat kernel is composed of three rather distinct parts: bran, endosperm, and germ, each having certain characteristics which make possible the milling of white flour.

Enclosed within the bran coat are the endosperm and the germ. The endosperm is the starchy central portion of the grain and also contains some protein. This is the storehouse of food to be used by the young plant while its roots are reaching out in the soil to obtain nourishment from outside sources. The germ, found at one end of the grain, is actually the embryonic plant. This portion of the grain is comparatively rich in fat, protein, minerals, thiamine, and vitamin E.

[1] Nutritional Committee News, Jan.-Feb., 1954.

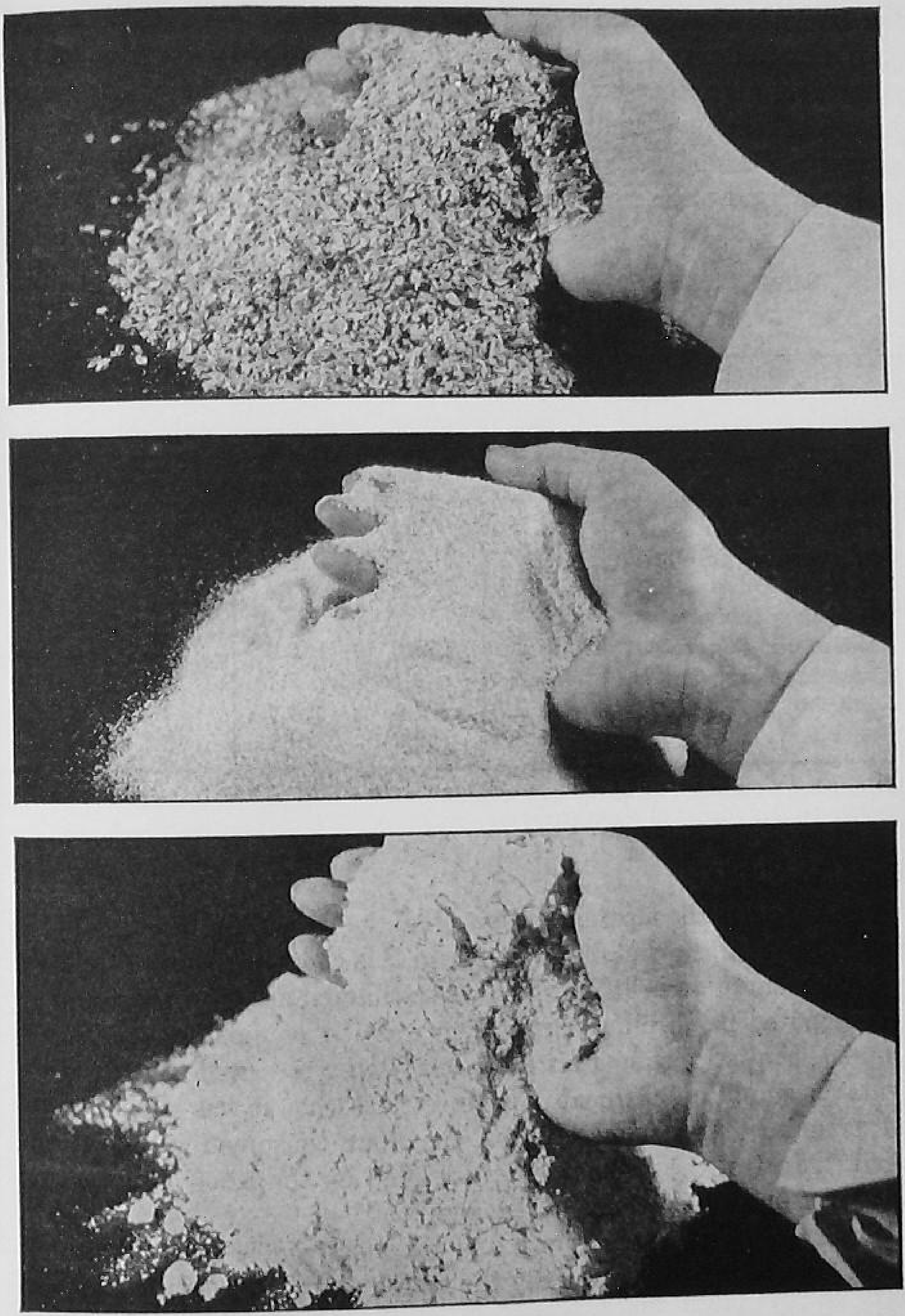
[2] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

The low water content of the grains, which makes necessary the supplying of additional moisture before the germ can sprout, is responsible for the excellent keeping qualities of cereals. Few grains when marketed have in excess of thirteen per cent moisture; mature grains, well dried, may be successfully stored for ten years or longer without requiring the expensive facilities of cold storage. Faulty storage may lead to contamination and loss through the work of rodents and such insects as weevils. Heating in the bin may also lead to loss. Today emphasis is being placed upon sanitation in the handling of cereals from the time of harvest through the processing and packaging of the product. The manufactured products are more susceptible than the whole grains to spoilage from other causes than rodents. Particularly is this true of milled products containing the entire grain and those containing a larger amount of outside covering of the grain and the germ, in which practically all the fat of the grain is concentrated. The kernel is literally a sealed package about the germ, thus protecting the fat from contact with the air. When this protection is destroyed, the fat tends to become rancid in a short time. Products containing a high percentage of the germ are more likely than others to become rancid. In addition, they are more likely to be attacked by insects. Since refined cereals, lacking the germ, are less liable to spoilage, their use presents a marked economic advantage, from this standpoint, over that of other milled products.

Milling

When milling of cereals first began is difficult to state. It is supposed that man early discovered that he preferred the flavor of the inside portion of the grain and set about to find a way whereby he could separate this portion from the rest. The outer portion is somewhat tough, and the inside is brittle and more readily granulated, so that it is comparatively easy to separate the two. When the work was done by hand it was laborious and slow. The white part of the grain was a luxury food used by the nobility, having only a holiday place in the fare of the working class. With the industrial revolution there came the development of machinery by which milling could be quickly and easily done. Now by far the greater portion of the grain used for human food is composed of the refined parts, freed from the bran and germ. This practice results largely in the discarding of the mineral, vitamin, and roughage content of the whole grain and further increases the problem of adequately supplementing any diet largely depending on cereal.

Of the grains now commonly milled, wheat, rice, barley, corn, rye, oats,



Courtesy of Wheat Flour Institute

Fig. 28

Wheat passes through a number of stages in the milling process, each of which results in a typical product such as these shown here. 1. After the first break. 2. Purified middlings. 3. The finished product.

and buckwheat are used over a widespread area. Millet and sorghums have a limited use in sections more or less unsuited to the production of other more important grains. In spite of the variety of cereals available, the use of some one grain predominates in most countries. In many important nations of the Western World, wheat is the leading cereal, and its use is reported to be slowly replacing that of rice in the East.

TABLE 16. COMPARISON OF PER CAPITA CONSUMPTION OF SOME CEREAL PRODUCTS IN THE UNITED STATES *

	1935–39 Average Pounds	1947–49 Average Pounds	1952 Average Pounds	1953 Average Pounds	1954 Preliminary Report Average Pounds
Cornmeal	22.8	13.4	12.3	12.0	12.0
Corn breakfast cereals	1.6	1.5	1.5	1.5	1.5
Oat food products	3.8	3.4	3.4	3.4	3.4
Wheat flour (white, whole wheat and Semolina)	157.0	135.0	130.0	125.0	124.0
Wheat breakfast cereals	3.3	3.1	3.1	3.1	3.1
Rye flour	2.2	1.4	1.5	1.4	1.4
Rice, milled	5.7	4.8	5.2	5.3	5.7

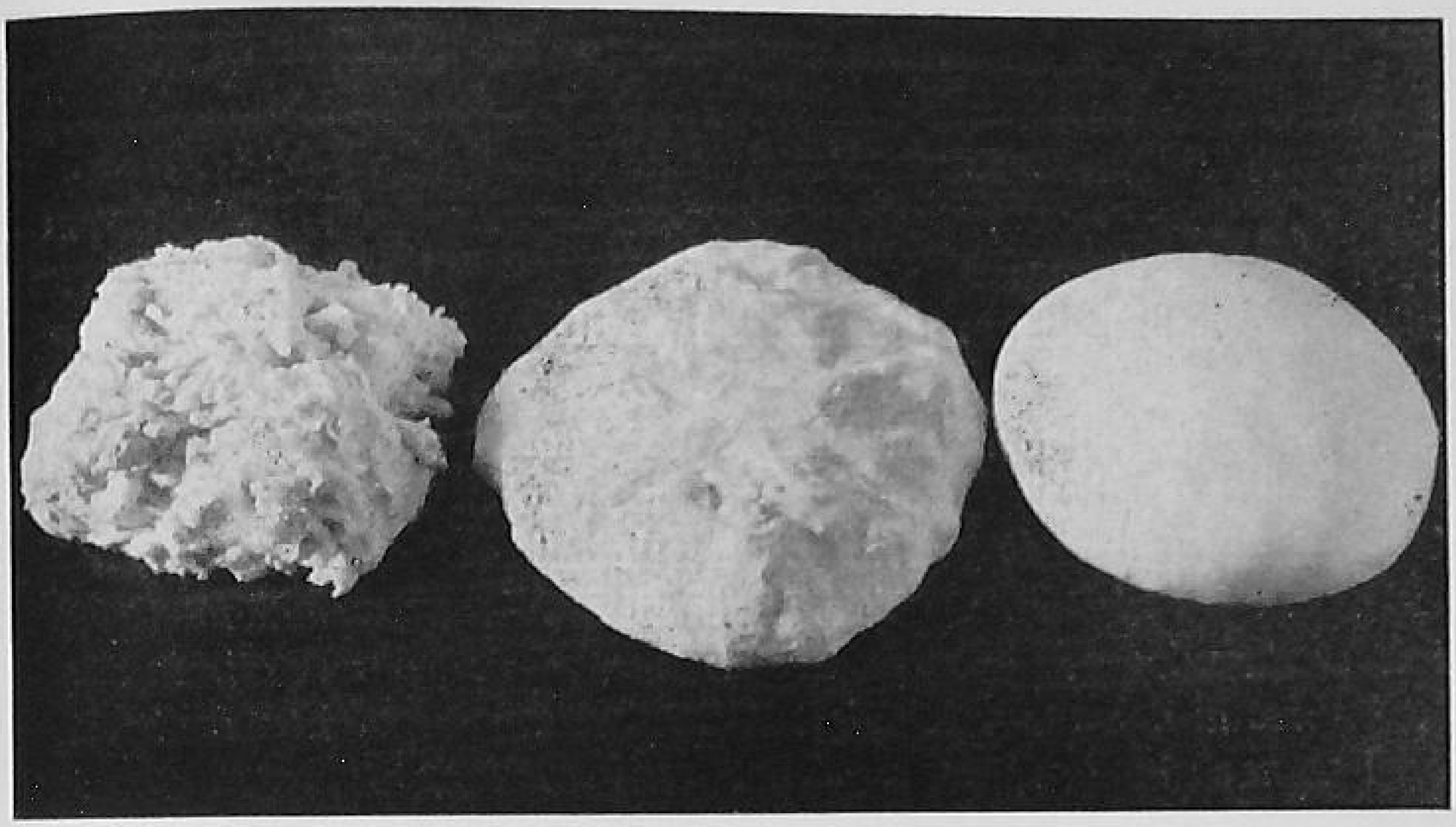
* Compiled from **The National Food Situation**, NFS–71, Bureau of Agricultural Economics, United States Department of Agriculture, February, 1955.

Wheat flour

Wheat flour is the most important of all the manufactured cereals. The place it holds in the diet of the people in this country is shown by the per capita consumption in 1952, which was estimated at 130 pounds. In 1946 the estimated per capita consumption was 154 pounds and in 1926, 180 pounds. Statistics show that there has been a steady decline in the per capita consumption of wheat flour since 1909 when it was estimated to be 214 pounds.[1] Approximately half the flour consumed is marketed as bread. Most of the remaining flour is used by the baker and the homemaker for making crackers, cakes, and pastries.

White flour is the best known and the most widely used of the wheat flours. White flour is essentially the starch and gluten of the endosperm of the wheat kernel. Perhaps because of the unsanitary conditions under which flour was milled some decades ago, the majority of people still asso-

[1] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.



Courtesy of Wheat Flour Institute

Fig. 29

Dough formation parallels the developing of gluten, as shown here from left to right: Flour moistened and stirred; gluten partly developed; gluten fully developed.

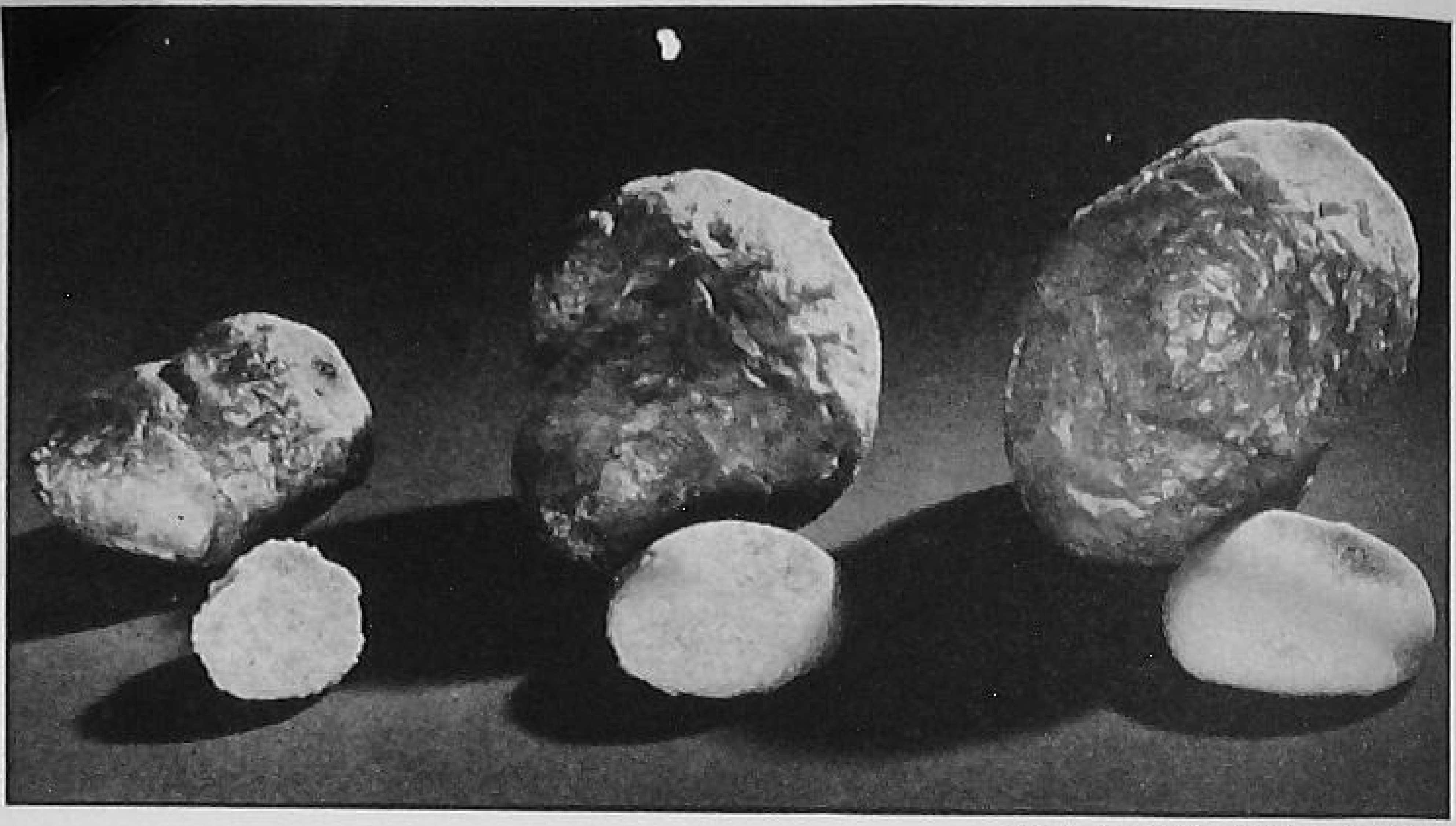
ciate whiteness with cleanliness, believing that the whiter the flour, the cleaner it is. The miller endeavors to obtain a product which will meet the approval of the consumer by careful removal of all parts of the bran and often by bleaching the remaining flour.

Bleaching removes the yellow or cream color from the flour by oxidizing the carotene, the pigment largely responsible for its color. Bleaching is commonly accelerated by the use of chemicals which may or may not affect the quality of the flour.

Swanson [1] divided wheat for milling purposes into three general groups or classes: (1) the hard wheats, (2) the soft wheats, and (3) the durums. The characteristics of the wheat within a class vary with climatic and soil conditions. Hence, the composition of wheat differs not only with class but also with conditions under which it is grown.

Based upon the purpose for which the flour is intended, it is divided roughly into hard-wheat flour and soft-wheat flour. Hard-wheat flour is commonly called "bread flour." Its suitability as a bread flour is due to the quality and quantity of protein present. When wheat flour is moistened with water, gluten is formed from the proteins in the flour. Water is

[1] C. O. Swanson, *Wheat and Flour Quality*. Minneapolis: Burgess Publishing Co., 1938.



Courtesy of Wheat Flour Institute

Fig. 30

Characteristic gluten balls are formed from each kind of flour. These expand with baking as shown here from left to right: Cake flour; all-purpose flour; bread flour.

absorbed in varying amounts, dependent upon the composition of the flour. The starch absorbs about 15 per cent of its weight in water, and since starch constitutes about 4/5 of the weight of the flour, it holds a considerable part of the water absorbed. The protein of flour absorbs water up to 200 per cent of its weight, so that it swells and develops into an elastic sticky dough. Thus it is evident that the hydration capacity of a flour may be greatly influenced by its protein content. The greater the hydration capacity of a flour, the greater the yield of loaves of bread from a barrel of it. Good bread flours from hard wheat usually absorb 60 to 65 per cent of the weight of the flour in water, indicating that the proteins present have the capacity of forming strong gluten. Flours from soft wheat absorb a lower proportion, and the proteins form a weak gluten. The nature of the gluten may be determined by adding enough water to flour to make a stiff dough which is kneaded until smooth and satiny (Fig. 29). Then the starch and water-soluble substances may be washed out of the dough under a stream of running water or in a bowl of water. The residue is the gluten.

The amount and strength of gluten yielded by a given flour determines its baking quality, that is, whether or not it can be used to make large well-piled loaves of bread. If the quality and quantity of protein present in the

flour is sufficient to develop the gluten necessary for bread making, dough made from the flour will have tenacity, cohesiveness, and elasticity. It will stretch and expand, manifesting a rubbery consistency under certain conditions (Fig. 30).

Dough made from flour with strong gluten catches and holds the large quantities of gas formed by the yeast plant without rupturing the encasing walls of the mixture. The usual manipulation necessary in the making of yeast breads does not destroy the cohesiveness of the dough.

In soft-wheat flour the gluten may be less in quantity and different in quality. Dough made from it as a rule yields or breaks more readily. In other words it lacks "strength," the quality characteristic of hard-wheat flour.

Whereas hard-wheat flour is especially suited to the making of yeast breads, soft-wheat flour is more likely to give that light porous structure which is desirable in cakes and pastries. It is better suited for use in products in which baking powder or soda is used as the leavening. Cake flour is milled from soft wheat. The protein content is low and the granulation is uniform and fine.

Pastry flour is usually made from soft-wheat flour. It is fairly low in protein content and is finely milled, though not so finely as cake flour. Pastry flour is designed for pastry and specialty products and is used chiefly by bakers and biscuit manufacturers.[1] It is usually possible to distinguish between bread and cake flour by their appearance and physical characteristics. A good bread flour is creamy-white, and when rubbed between the fingers is somewhat granular. When pressed lightly in the hand, it will not hold its shape. Cake flour is starch-white, very fine, almost powdery, and holds its shape when pressed lightly with the fingers.

The term "flour" today when unqualified usually refers to all-purpose, general-purpose or family-type flour. As the term indicates, this flour is in between bread flour and cake flour in its characteristics and may be used for all cookery purposes although it may not make the lightest loaf of yeast bread nor the finest cake. All-purpose flour may be milled from a blend of hard and soft wheats, the flour from such wheats may be blended or it may be milled from wheat intermediate in characteristics. There is a tendency in the north or the hard-wheat producing areas to use more hard wheat and the resulting flour contains enough protein to make good yeast bread. In the south more soft wheats are used and there, all-purpose flour makes especially good quick breads.

In addition to classifying flour according to the kind of wheat from which

[1] *Handbook of Food Preparation*, American Home Economics Association, 1954.

it is made or according to use, it may also be classed according to milling process, although these divisions are often referred to as grades rather than classes.

As the wheat is milled, many streams of white flour, each of slightly different quality, are obtained. The total yield of these streams varies with the product desired. In this country it is approximately 70 per cent of the original wheat. The proportion in which the different streams are combined determines the grade of the flour. The miller grades white flour as straight grade, patent, and clear. Straight grade flour may contain 97 per cent or 100 per cent of all of the white flour milled. If 97 per cent straight grade flour is to be made, the 3 per cent of lowest grade is not included. Straight grade flour, although not the highest grade obtainable, is a good flour and is satisfactory for many purposes.

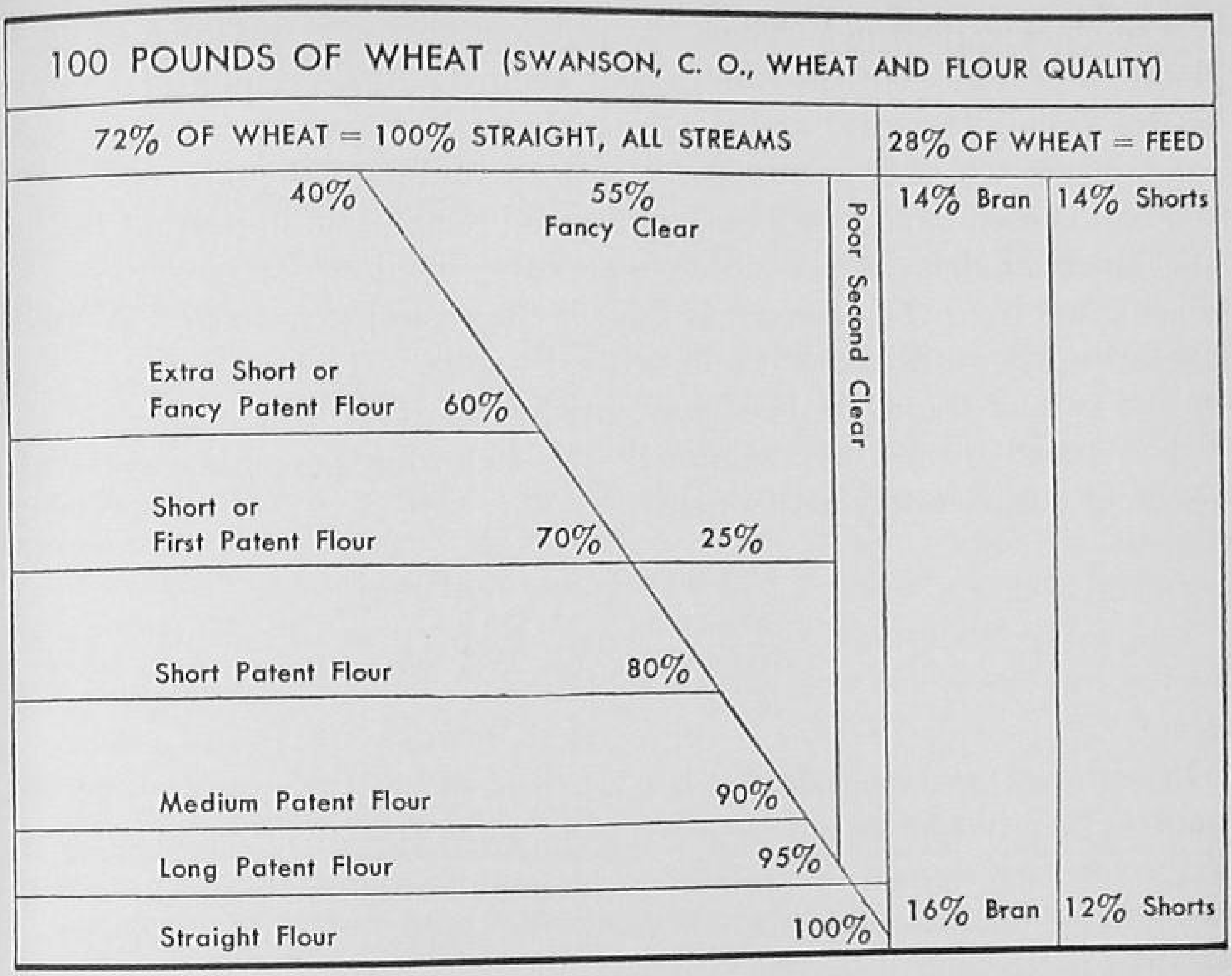
Frequently the streams of flour which would give the straight grade flour if combined, are divided to give different grades such as patent and clear.

Patent flour is the highest grade of flour obtainable on the average market. It is made from the best streams of flour, from 40 to 95 per cent of the total yield of white flour being used in its production. According to Swanson,[1] patent flour may be subdivided into "extra short patent," "short family or first patent," "short patent," "medium patent," and "long patent." The highest grade of these, the extra short patent, is made up of from 40 to 60 per cent of the best white flour, whereas the long patent may contain as much as 95 per cent of the white flour. The remaining 60 to 65 per cent of flour is known as "clear" and may be divided as to quality into "fancy clear" and "first clear" or "first clear" and "second clear." Sometimes flours lower than "second clear," known as "low grade" or "red dog," are separated. These are used primarily as stock feeds.

Cake flour is usually a short or very short patent flour and the bread flour considered most desirable is also a patent flour.

In addition to the many classes and grades of white flour a limited amount of whole wheat, graham or entire wheat flour is milled. By definition this is "the food prepared by so grinding cleaned wheat other than durum and red durum" that the proportions of the natural constituents of the wheat remain unaltered. The term Graham was applied to the whole wheat product many years ago when Sylvester Graham advocated the use of the entire grain for making flour to be used in bread. He considered this to be a more healthful practice than the use of refined flour. The superior nutritive value and the poorer keeping quality of graham

[1] C. O. Swanson, *Wheat and Flour Quality*.



Courtesy of Wheat Flour Institute

Fig. 31

Many different grades of flour may be milled from one hundred pounds of wheat, as indicated in this graph.

flour and the greater preference of the majority of consumers for white flour have resulted in definite milling and distribution problems. This has been solved in part at least by the enrichment program.

Enriched flour is white flour with specified amounts of thiamine, riboflavin, niacin, and iron added. It may also have calcium and possibly an amino acid, lysine, added. Enriched flour is, as far as is known, equal in nutritive value to whole wheat flour when consumed in our ordinary diet. The importance of the enrichment program is shown by the use of approximately 660,000 pounds of niacin, 77,000 pounds of thiamin and 44,000 pounds of riboflavin [1] to enrich three-quarters of all bread, flour and other cereal products consumed in this country in 1953.[2]

[1] "Major Contributions to World Health by Chemical Additives to Foods Cited before AAAS." Journal Agricultural and Food Chemistry 2:6–7, 1954.

[2] *Your Food and Chemical Research.* Manufacturing Chemists' Association, Inc., November, 1953.

Enrichment does not change the physical character or taste of white flour. The use of enriched white flour assures a food product high in nutritive value (Table 17) and free from the problems of storage that have made whole wheat flour unpopular with the milling industry.

Flour is used largely for bread, and bread remains an important food in the American diet. American diets are often low in thiamine, riboflavin, niacin, and iron. Enrichment of flour is the easiest way to provide these needed nutrients without changing food habits. It was estimated that 65 per cent of the white flour was enriched in 1952. Eight slices of enriched bread furnish approximately the following percentages of daily needs of a moderately active man.

Thiamine	30%
Riboflavin	20%
Niacin	25%
Iron	32%

At the present time enrichment is tending to be an accepted practice not only for flour but for bread, cornmeal and a great variety of cereal products as may be determined by examining the label on the package.

Prepared flours of various kinds are on the market. One of the simplest of these is the self-rising flour, a combination of flour, salt and baking powder or of sodium bicarbonate and an acid calcium salt in limited amounts in place of the baking powder. Phosphated flours contain monocalcium phosphate only. Other prepared flours contain additional ingredients as dry milk solids, dehydrated eggs, fat, sugar and many other ingredients.

Self-rising flour, by the addition of one or more ingredients, may become a mix. Today there are few products made with appreciable amounts of flour which cannot be purchased as a mix whether it be pancakes, yeast rolls, chocolate cake, pastry, cookies or angel cake. The convenience of these products as well as the improved quality, and in many instances, the reasonable cost, has led to wide acceptance of these preparations.

Macaroni products

In certain European countries, Italy in particular, macaroni and spaghetti, sometimes called alimentary pastes, are as important products of wheat flour as is bread. The basis of these is durum wheat, a hard wheat with a high gluten content. A yellow color is highly desirable in macaroni, hence certain strains of durum wheat are much prized because they are rich in the yellow pigment. In making the pastes, the coarse flour, called

TABLE 17. NUTRITIVE VALUE IN ONE CUP OF COMMON WHEAT FLOURS *

Flour	Weight of 1 cup Grams	Food Energy Calories	Protein Grams	Calcium Milligrams	Iron Milligrams	Thiamine Milligrams	Riboflavin Milligrams	Niacine Milligrams
Whole wheat (graham)...	120	400	16.0	49	4.0	.66	.14	5.2
80% extraction	110	401	13.2	26	1.4	.28	.08	2.3
Self-rising, enriched ...	110	385	10.1	299	3.2	.48	.29	3.8
All-purpose, unenriched .	110	401	11.6	18	.9	.07	.05	1.0
All-purpose, enriched....	110	401	11.6	18	3.2	.48	.29	3.8
Bread flour, enriched....	112	408	13.2	18	3.2	.49	.29	3.9
Cake or pastry flour.......	100	364	7.5	17	.5	.03	.03	.7

* All flour sifted before measuring except whole wheat which was stirred.

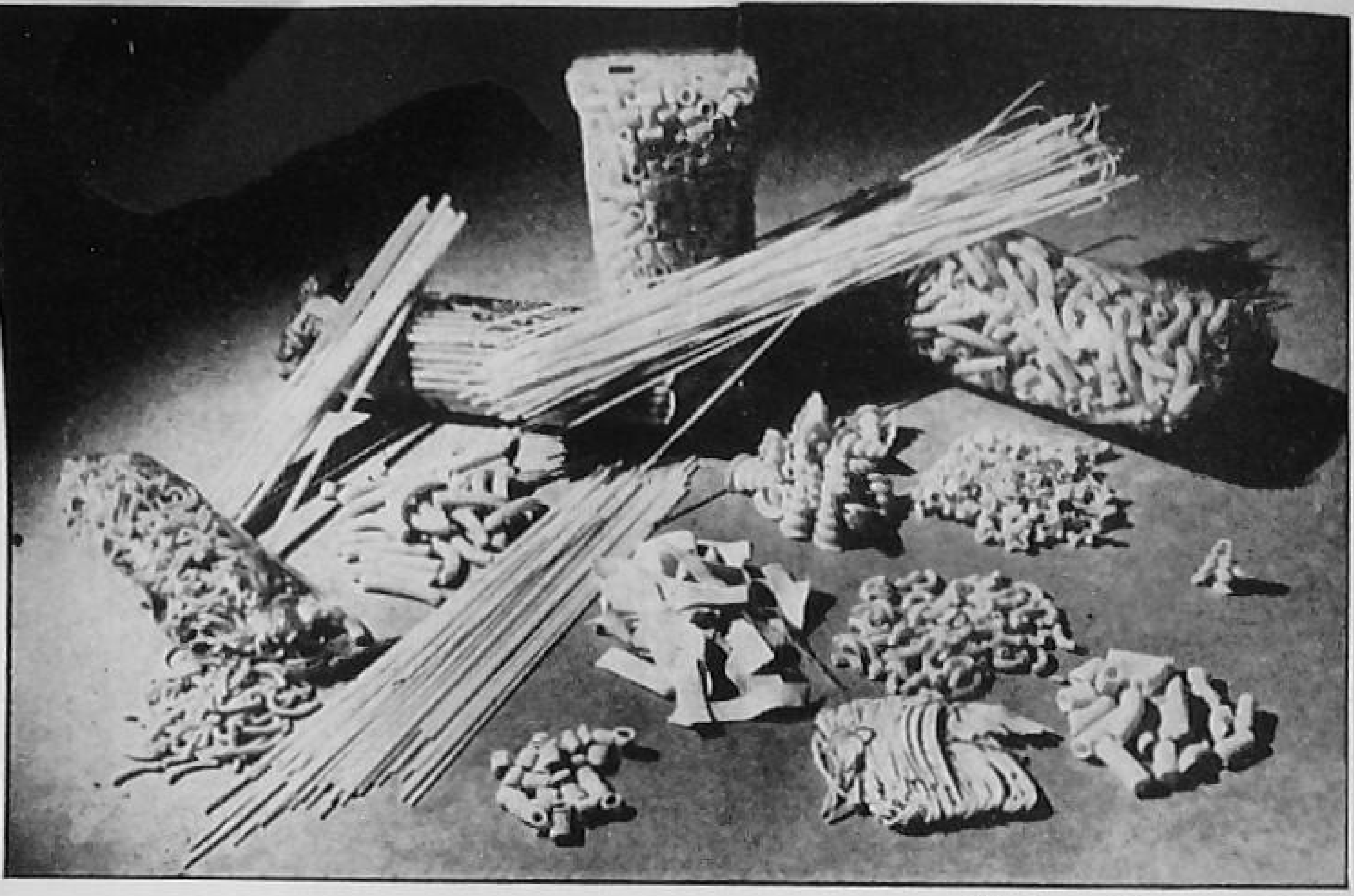
* **Composition of Foods — Raw, Processed, Prepared,** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

semolina, was formerly mixed to a stiff dough with boiling water, after which it was kneaded thoroughly. The finished dough was then placed in a cylinder, the lower end of which was fitted with a disk perforated with openings through which the dough was forced by pressure, forming characteristic shapes as it came out.

Today the processes which were once handled by individual machines are handled by a single unit with a continuous feeding system for the semolina and water, continuous mixing and continuous kneading and extruding devices. The shaped pastes then pass through a continuous dryer rather than being placed in small drying chambers or drying cabinets. The most familiar of these shaped pastes are macaroni, the large pipes; spaghetti, the slender tubes; and vermicelli, the tiny rods.

Noodles are strap- or ribbon-shaped pastes which include at least 5.5 per cent by weight of egg or egg yolk solids. Alimentary pastes like many other cereal products may be enriched.

Good macaroni or other alimentary paste products hold their shape well and swell to about twice their original size when cooked in boiling, salted water. They are tender but firm, not pasty or sticky.



Courtesy of Consumer Reports

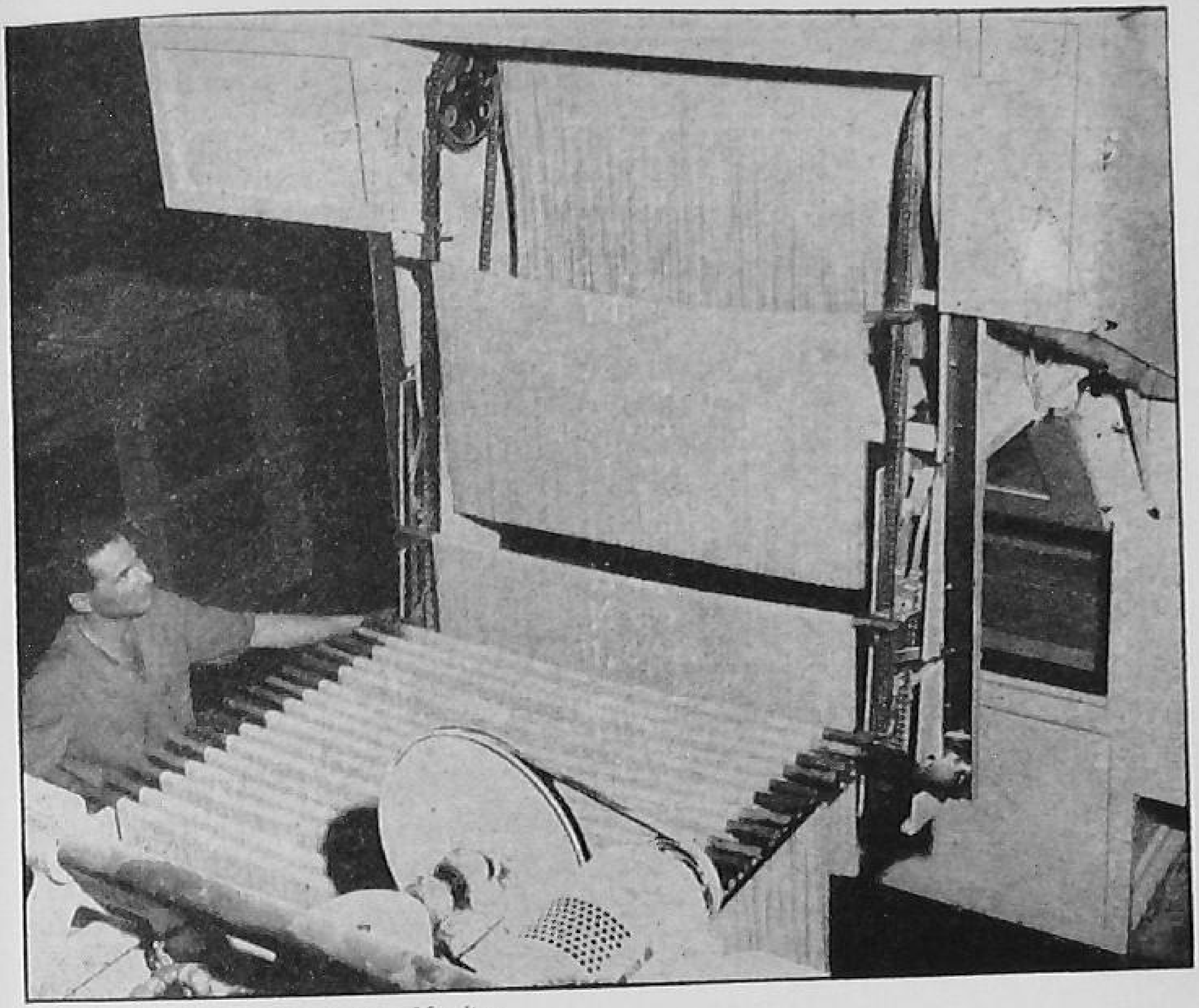
Fig. 32

Alimentary pastes are shaped not only as macaroni and spaghetti but as alphabets, rings, sea shells, and other fancy forms.

Wheat breakfast cereals

During the last quarter century, the breakfast cereal has assumed great importance in the American dietary. In this development wheat products have maintained an important rôle.

Whole, cracked, ground, and rolled wheat are all commonly found on the market, and all require some preparation in the home. Puffed wheat, a popular prepared cereal, is made by enclosing the wheat in cylinders which are sealed, then revolved at a temperature of 288° C. (550° F.) until the moisture of the grain is changed to steam. When the cylinder is suddenly unsealed the steam contained in each grain explodes, pulverizing the starch granules and puffing the grain. In addition to these, other cereals from wheat include wheat flakes, the steamed, rolled, and toasted wheat grains; muffets, triscuits, and shredded wheat biscuits, made by passing a stiff mixture of cooked wheat through machines especially designed for this purpose, after which the product is shaped in characteristic forms and toasted. Most of the packaged cereals available are now enriched.



Courtesy of The Christian Science Monitor

Fig. 33

Spaghetti — by the thousands of miles!

Barley

Although wheat is the most used grain in the western hemisphere and is even termed the "aristocrat of cereals," it has not attained this position because of longest use. Most evidence indicates that barley preceded it. Pliny regarded barley as the most ancient food of mankind. The goddess Ceres is often represented with ears of barley braided in her hair. As a food, barley is used in this country mainly as flour or meal for persons allergic to other grains, for infants or invalids, as a breakfast food, and as pearl barley for thickening soups. Pearl barley is the polished grain with the bran removed. Barley is lacking in gluten, to which wheat owes its bread-making qualities. As a result, a light, porous loaf cannot be made from it, but it is possible to combine barley flour with wheat flour in the proportion of one to five and obtain an acceptable loaf of bread. In Central and Northern Europe it is an important breadstuff.

The barley breakfast foods are, for the most part, made from malted

barley. This is a product resulting from the actual sprouting of the barley grain. During the process of sprouting many changes occur within the grain. From the standpoint of use, the most important of these is the formation of diastase, an enzyme capable of changing starch to maltose, a fermentable sugar readily acted upon by yeast. Malt is much used with starch in the making of yeast and the production of fermented products such as certain beverages and bread. Malted barley is also used in malted-milk beverages, in coffee substitutes, and in the malt syrup used in bakeries and confectionery establishments.

Rice

It is probable that rice did not enter the diet of man as early as did wheat and barley. Nevertheless, it has for centuries been a staple article of food for many peoples. The hot, moist climates unsuited to the production of other grains afford the conditions suitable for the production of rice and give it particular importance in the world's diets. It is ranked by some as having the foremost place among the foods of man. The amount consumed varies widely in the different countries. Whereas the estimated annual consumption in the United States [1] is placed at slightly over five pounds per capita, in Puerto Rico it is 140 pounds, in Hawaii 235 pounds, and in Japan 330 pounds. Rice, unlike most cereals, is not extensively used in the making of bread. It is eaten largely as a boiled grain, with the addition of seasonings if they are available. The whole grain with just the husk removed may be used. This product is known as unpolished or "brown rice." As a rule, however, in this country the grain is preferred with the bran removed. This is known as polished rice. In the preparation of this product, the rice is subjected to several treatments. After the husks are taken off, the milling or whitening process which removes the bran follows, then grading, and finally polishing and facing. The last two steps mainly affect the appearance of the product, although the facing may protect the surface and retard deterioration. The removal of the bran definitely affects the food value, as is shown in Table 18.

Rice may be improved in vitamin and mineral content by enrichment, that is by adding vitamins and minerals, or by conversion. The latter is a modernized method of parboiling the rough rice so that the water soluble B-complex vitamins and the minerals from the hulls, the bran layer, and the germ are more uniformly distributed in the entire grain. The rice is then dried and milled. The resulting product sometimes referred to as converted rice is somewhat higher in thiamine, riboflavin, and niacin than

[1] Harry W. Von Loesecke, *Outline of Food Technology*, 1942.

the white or milled rice (Table 18) though by no means equal to the brown rice.

TABLE 18. NUTRITIVE VALUE IN ONE CUP OF VARIOUS TYPES OF RICE*

Rice	Weight of 1 cup Grams	Food Energy Calories	Protein Grams	Fat Grams	Carbohydrate Grams	Calcium Milligrams	Iron Milligrams	Thiamine Milligrams	Niacin Milligrams
Brown	208	748	15.6	3.5	161.6	81	4.2	.66	9.6
Converted	187	677	14.2	.6	148.5	45	1.5	.38	7.2
White or Milled	191	692	14.5	.6	151.7	46	1.5	.13	3.1
Precooked (minute)	110	420	9.7	.2	91.6	4	.9	.02	.1

* **Composition of Foods — Raw, Processed, Prepared.** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

Precooked rice is now widely used by those who want a product which requires only a few minutes to prepare. The cooked product varies somewhat from that prepared from regular rice. Rice products commonly used as breakfast foods include puffed rice, rice flakes, and rice crispies. Rice flour and rice starch are probably less familiar. The flour is too low in protein to be used alone for bread-making, but is used for making tea cakes and cookies and sometimes is combined with wheat flour for bread. Rice starch is used to some extent in foods and for laundry purposes, although its widest use is for face powders.

Wild rice is not a true rice but the seed of a grass that grows wild in shallow lakes and marshes along the Great Lakes and the Mississippi. It is also known as Indian, water, or black rice and as water oats. The Indians used this cereal as a food. The kernel is narrow and cylindrical in shape and dark in color. It is said to be of greater food value than cultivated rice. Only a small amount reaches the market, and the price is much above that of other cereals. However, it is considered a delicacy by many, perhaps because of its distinctive flavor, and is much prized as a stuffing for game or a dish to be served with game.

Rye

Rye, compared with wheat and rice, is of minor importance as a world food. However, in certain countries it is the chief cereal food for it is most used in areas in which the climatic conditions are unsuited to the successful growth of other cereals. It is light and bulky and does not enter largely

into international trade, most of it being consumed in the country where grown. Its use in the United States, although still limited, is increasing. Rye is the only cereal besides wheat which contains a protein of such a nature as to make it desirable for bread-making purposes. The protein of rye differs from that of wheat, being rather soft and sticky and not as strong as that of hard wheat. Consequently the loaf of bread made from rye flour is not as light and porous as one made from wheat flour.

The chief use of rye is as flour, but some is used coarsely ground as a breakfast food similar to farina.

Corn

Of the important cereals, only corn is credited as being a product of the New World. Corn was recognized as an important article of food by the American Indians before English and European settlers arrived in this country. The pioneers early saw its value and soon made it one of their important crops, for it could be used in a variety of ways. Parched corn made by heating the whole grain by the fire, hominy made by removing the outside hull with lye, mush made from the ground corn; these and cornbread were all important articles of the diet. Today corn is appreciated as a human food by few nations, in spite of the fact that it has a great variety of uses. The immature ear is used as a vegetable and gives the roasting ear with which all are familiar. The mature grain is made into breakfast cereals, hominy preparations, meal, flour, oil, and starch.

Corn flakes and puffed corn are examples of corn breakfast foods. Hominy in its most familiar form is essentially the mature corn grain with the hull and germ removed. Hominy grits, or granulated hominy, is the hulled grain run through a grinding machine to give a granulated product, which may be either coarse, medium, or fine. The coarse grits are also called pearl hominy, samp, and coarse hominy. Cornmeal, as formerly made, included practically the entire grain. The grinding was first done by hand, but later water power was utilized. As a result the term "waterground" was often applied to cornmeal. This is now commonly known as "Old Process" cornmeal, in contrast with the more recently developed "New Process" meal. In making the latter not only is the hull removed but also most of the germ. The New Process cornmeal is lower in minerals, fat, protein, and, to many, in flavor than is the waterground. It has, however, much better keeping qualities.

To compensate for the nutrients lost when the corn is refined, cornmeal, corn grits and other corn products may be enriched. Cornmeal may be made from either white or yellow corn. Because of the vitamin A value of

yellow corn, yellow cornmeal is increasing in favor. Corn flour, made by milling the white cornmeal, consists largely of starch and has a limited use in pancake flour and similar preparations.

Corn oil, extracted from the germ by pressure, is becoming increasingly important as a substitute for olive oil. Over two hundred million pounds of corn oil were consumed in 1952 in this country.[1]

Cornstarch, obtained from the endosperm of the corn, is the starch most used in the household for thickening desserts, sauces, and similar products. When treated with acid and heat, cornstarch gives dextrin, corn syrup, or corn sugar. The product obtained depends upon the degree of treatment applied.[2] The use of corn sugar is fairly recent.

Oats

Oats is the main cereal crop in Great Britain. There, as in other countries, the grain is used largely for feeding livestock, but much is used for human consumption. To many people, oats as a term for human foods means oatmeal, the term being applied indifferently to both the ground or cut oats and the rolled oats. In preparing the grain for any of these, the first step is the removal of the husk which surrounds the kernel or "groat." The outer layers or bran of the oat kernel adhere tightly to the endosperm, so oats are used as a whole-grain cereal. Oatmeal may be either "steel cut" or Scotch oatmeal. The former is made by special cutting machines while the latter is ground. The rolled oats are made by steaming the oat groats, passing them through rollers, and drying. The most popular form of rolled oats is semi-cooked, often called "quick-cook" rolled oats. Both the oatmeal and the rolled oats are used as breakfast food or as porridge. The meal may be used in muffins, cookies, cakes, and wafers. Due to the lack of gluten, the flour is little used for bread making.

Buckwheat

Buckwheat is really not a cereal, for it is not the fruit of a grass like a true cereal, but the fruit of a herbaceous plant. However, its nature and

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

[2] Starch is a complex product which may be broken down by hydrolysis to a series of products. The breaking down of the starch in the presence of moisture may be accomplished by enzymes, by acid with or without heat, or slowly by heat alone. The products obtained are: starch, dextrin, maltose, and glucose.

Dextrin results when the treatment is applied for a comparatively short time. Corn syrup, a mixture of the products dextrin, maltose, and glucose, results from longer treatment, while the production of corn sugar, actually glucose, indicates that the hydrolysis is carried to completion.

use so closely resemble that of cereals that it is usually grouped with them. The chief use of buckwheat is for making a flour for griddle cakes. It is much used in prepared griddlecake flours, either alone or in combination with wheat or other flours.

PROBLEM 2 *How shall breakfast cereals be prepared?*

The use of cereals as a food goes as far back as human records. Methods of manufacture have been developed which insure a variety of standard products at a relatively stable price, thus accounting in part for their present widespread use in America as breakfast foods. The increased use of vegetables, fruits, and meats in the other meals of the day leaves for cereals an important place only in the breakfast menu, and thus provides good reason for their use as a chief food at this meal.

Selection

The array of breakfast cereals on the market makes variety in selection possible. The shelves of most grocery stores are crowded with attractive packages of breakfast foods made from different cereals.

Obviously, the nutritive value of the cereals should be given careful consideration. Whole grains are, as a rule, higher in protein, fat, mineral, and vitamin content than refined cereals.

Some cereals have been irradiated to provide vitamin D, others have been restored to the level of the whole grain in certain nutrients and still others have the germ of the grain added. Thiamine and iron are probably the most often added nutrients but niacin and riboflavin as well as tricalcium phosphate are used by some manufacturers to enrich refined cereals.

From each of the grains there are usually three forms of cereals marketed: those that are uncooked, those that are partially cooked, and those that are entirely cooked during the process of manufacture. To the first class belong the whole and cracked grains and many of the granular forms. The partially cooked cereals are for the most part rolled or flaked grains, although a few of the granular cereals belong to this class. These have been partially cooked in the process of manufacture to shorten the required cooking period and are marketed as "quick-cook" cereals. In the

preparation of rolled or flaked cereals of this type, not only are they precooked, but they are in finer flakes than the flaked cereals requiring long cooking.

Ease of preparation is an important item in the selection of these foods. It is much easier to serve a dish of corn flakes than to prepare and serve a dish of cracked wheat or rolled oats. This point is likely to receive consideration if one prepares his own breakfast. The selection of a ready-to-eat cereal is more frequent in summer, as a light, crispy dish is more acceptable at this season than a hot one. In hot weather, too, there is usually a greater desire to save labor. It is recommended, however, that at least one hot dish be included in each meal, particularly during the winter months. Often a hot cereal is most satisfactory for this purpose. So, although ease of preparation may be an item influencing the choice, too much emphasis should not be placed upon it.

The cost of the cereal may also affect the choice. As a rule, the more home preparation a cereal requires the less is the initial cost to the consumer. A portion of cereal which supplies 100 calories of energy is usually

TABLE 19. COMPARATIVE COST OF CERTAIN CEREALS

Cereal	Type	Weight	Cost	Approximate Measure per 100-Calorie Portion as Purchased	Cost per 100-Calorie Portion
Bran flakes	Ready to eat	8 oz.	.11	1 c.	.014
Corn flakes	Ready to eat	13 oz.	.15	1 c.	.012
Cream of wheat	Raw	14 oz.	.26	1/5 c.	.019
Dwarfies	Raw	30 oz.	.28	1/5 c.	.010
Georgie Porgie	Raw	29 oz.	.29	1/5 c.	.010
Grapenuts	Ready to eat	12 oz.	.17	¼ c.	.014
Grapenut flakes	Ready to eat	7 oz.	.13	⅔ c.	.019
Oats, rolled	Raw	1 lb.	.10	2/5 c.	.006
Pettijohn	Partially cooked	22 oz.	.20	⅓ c.	.010
Puffed rice	Ready to eat	4½ oz.	.13	1⅔ c.	.029
Puffed wheat	Ready to eat	4½ oz.	.11	2 c.	.025
Rice, brown	Raw	1 lb.	.17	2 T.	.011
Rice, white	Raw	1 lb.	.17	2 T.	.011
Shredded wheat	Ready to eat	12 oz.	.15	1 biscuit	.013
Wheaties	Ready to eat	8 oz.	.13	⅔ c.	.016
Whole wheat	Raw	1 lb.	.05	2 T.	.003

* Based on prices in Manhattan, Kansas, July, 1947.

considered a serving, though great variation exists in the apparent bulk of cereals of the different types. Ready-to-eat cereals may range from one half cent for a 100-calorie portion to two or even three cents. Cereals requiring cooking may vary from .003 to .017 cents for a 100-calorie portion. Bread, a cereal product, though not considered a breakfast food in the same sense as those just discussed, costs about .013 cents for a 100-calorie portion.

Preparation

Doubtless man first consumed cereals as whole grains, with no preliminary preparation. Sometime after his mastery of fire, he learned that heat increased the palatability of these foods, and the parching of grains became an accepted cookery process. Later the discovery was made that the combined application of water and heat improved the cereal still more. Today, the preparation of cereals is based upon these simple processes. Whether the cooking be done in the process of manufacturing or in the home, its purpose is the same: first, to increase palatability and improve appearance; and second, to increase digestibility. The first is important because of the appeal to the appetite and the stimulating effect of well-flavored attractive food upon the flow of digestive juices; the second is important because a greater portion of the nutrients of the grain is made available for digestion. The nutrients of cereals are enclosed within the walls of crude fiber, and to the extent that these walls are broken down, the nutrients are exposed to the action of the digestive juices. Crushing or grinding the grain by milling and by mastication helps disintegrate the fiber. Heat and moisture aid the process by softening the cell wall components or the cellulose and by causing the starch granules to swell and gelatinize. As the fiber softens and the starch granules swell, the flavor changes also. All the prepared breakfast cereals have undergone some of these changes to a greater or less degree in the course of their preparation. The consumer may not be conscious of the extent of these changes, since the prepared cereals have been steamed or boiled, dried, and often toasted in the process of manufacture. With the uncooked or partly cooked cereals, however, the most striking changes in physical nature occur during preparation in the home.

Cereals contain a high percentage of starch, a compound that is much affected by heat. In cereals as in other plant tissues, starch occurs in the form of minute granules. These granules vary in shape and size but act in much the same way when heated. Whether raw or partially cooked cereals are being prepared, the changes brought about by moist heat are

similar. In cold water, cereals swell only slightly, but as heat is applied the swelling increases rapidly until the maximum size of the granules is reached.

Although rapid swelling of starch occurs between 50° and 65° C. (122° and 149° F.), swelling of the starch continues until a somewhat higher temperature is reached. The temperature and time required to gelatinize the starch completely depends on the size of the particles and the previous treatment. Gelatinization cannot take place until the water reaches the starch. A fine granular wheat cereal may require only a few minutes to reach maximum gelatinization while whole grain wheat may require a few hours. Even though a cereal is quite completely gelatinized in a few minutes, it is sometimes desirable to cook it a longer time because of the flavor which develops. The starch granules do not, as a rule, disintegrate upon heating but remain whole. If too high a temperature is used, as may be obtained in a pressure cooker, some dextrinization may occur and the cereal becomes sticky, gummy, and somewhat undesirable. The cellulose is affected by moist heat also. Although not rendered digestible to any appreciable extent, it is softened so that it is more palatable and more easily chewed. Dry heat changes the starch to a soluble form and then to a series of dextrins. If the heating is long continued, carbonization occurs and finally carbon dioxide, other carbon compounds, and water result. However, in the preparation of cereals the heating is stopped long before this occurs. In the toasted, ready-to-eat cereals, a portion of the starch is dextrinized. The dextrins produced by dry heat are usually brown. They are different in flavor from starch, having a nutty taste which many people like. Dry heat has little effect upon the cellulose.

Important in the preparation of cereals is the combining of the cereal with water and the application of heat in such a manner that a uniform gelatinous mass results. This involves equal exposure of all particles of the cereal to water and heat; otherwise the product will be lumpy. When a mass of cereal is placed in hot water, those particles on the surface, exposed to the moisture, form a thick gummy mass enclosing the inner particles of dry uncooked cereal. Particles in the center of such a lump remain almost unchanged during the cooking process. The manner in which the cereal and water are combined largely determines whether or not lumps are formed. Granular cereals, in particular, need careful attention when their cooking is started to obtain an even dispersion of the granules in the water.

Three methods are used to obtain an even distribution of particles so that lumping will not occur in the cooking of cereals. The first method

depends on the agitation of the boiling water while the cereal is being added. The second depends on the treatment of each particle with cold water *before* it is subjected to heat. The third depends on first subjecting each particle to hot water.

Method I. Have the salted water boiling rapidly. Slowly add the cereal, stirring the whole or flaked cereals only as much as is necessary, using a fork. This aids in preserving the shape. Cook over direct heat until the cereal has absorbed the water and becomes quite thick.

Method II. Stir the cold water into the cereal. Heat very gradually to the boiling point without stirring. Continue cooking the required time.

Method III. Stir the cereal into the water somewhat below the boiling point. Continue stirring until the boiling point is reached. Continue cooking the required time, stirring occasionally as needed. This method is seldom described but gives excellent results.

Whether the cereal and water are combined by Method I, II, or III, long slow cooking is desirable for the uncooked cereals. This brings about the greatest development of flavor and softening of fiber. Cooking may be done directly over a slow fire, but the use of a double boiler requires less careful watching.

When a cereal of the quick-cooking type is used, a much shorter cooking period suffices, although it is probable that a more desirable product results from a cooking period longer than the one to three minutes sometimes given in the directions for preparing a specific cereal. In the case of the partially cooked cereals, the use of a double boiler is usually unnecessary. Any time saved in watching the cereal is probably canceled by the time involved in the care of the extra utensils. Other factors which affect the time of cooking are the amount of cellulose present and the size of the particles.

Most uncooked cereals are ready to be cooked when purchased. Even rice needs no washing and "enriched" rice should never be washed. Rice may be steamed, cooked in a double boiler, or boiled in a large quantity of boiling water. The latter method is said to keep the grains separated best, but boiling must not be too vigorous or the surface of the grains becomes rough. This method can result in excessive loss of nutritive value and has little to recommend it. Steaming or cooking in just the amount of water that will be absorbed by the rice gives excellent results. The length of the cooking period for rice depends upon the method and upon the variety of rice used. Both washing and cooking of rice in a large amount of water should be discouraged.

As a rule, each class of raw cereals takes up a certain amount of water. The amount of water added determines the volume of the cooked cereal and, to an extent, its consistency.

Table 20 is helpful in suggesting the general proportions for various types of cereals.

TABLE 20. GENERAL PROPORTIONS IN CEREAL COOKERY

Type of Cereal	Amount of Cereal	Amount of Water	Salt
Flaked..............	1 cup	2 cups	½ teaspoon
Whole and cracked...	1 cup	4 cups	1 teaspoon
Granular............	1 cup	5 or 6 cups	1¼ to 1½ teaspoons

Cereal products marketed in packages usually have carefully tested proportions given. It is wise to follow these directions, at least the first time the product is used. Variety may be obtained in cereal preparation by substituting milk or fruit juices for water in cooking. The addition of dried fruits, such as figs and raisins, to the cereal early in the cookery process makes a delicious dish. Proportions usually suggested are one fourth to one half cup of fruit to a cup of dry cereal, though the amount may be increased if personal choice so dictates.

Canned and cooked fruits, such as peaches and apricots, are sometimes added to the cereal just before removing from the fire. Fresh fruits, such as berries, are added just before serving.

Ready-to-eat cereals have first been completely cooked and then dried until crisp during the manufacturing process. Under certain conditions, however, they may absorb moisture from the atmosphere and thus lose their crispness. If so, removal of the excess moisture before serving is necessary to restore crispness. This is usually done by placing the cereal in a heated oven for a few minutes.

Service. The service of the cereal largely determines its acceptability. It is often found that a large dish of cereal may meet with a distaste that would not be expressed for one of moderate size. Aversion is rather generally shown toward a serving of cooked cereal which has, through exposure to the air, lost enough moisture on its surface so that a tough dry skin has formed. Temperature too, is important in the acceptability of cooked cereals. Lukewarm oatmeal — like lukewarm hospitality — lacks zest and interest. Color and contrast may be added to cereal dishes through combinations made with fruits of various sorts. Cream and top milk are

usually served with cereals, though butter is sometimes preferred for hot cereals.

ACTIVITIES

1. Compare the cost of 100-calorie portions of the various cereals available on your market.
2. Set out on the table for inspection 100-calorie portions of these cereals.
3. Cook a portion of rolled oats (not quick cooking) or cracked wheat in a pressure cooker; and cook another in the deep-well cooker of the stove. Compare the finished products.
4. Prepare and evaluate uncooked cereals, selected from among the following:
   - Parched wheat
   - Quick rolled oats in milk
   - Cracked wheat
   - Cream of wheat with wheat germ added
   - Farina with dates
   - Grape Nuts Wheat Meal
   - Parched rice
   - Pettijohn
   - Wheatena with figs
   - Unpolished rice
   - Malt-O-Meal
   - Dwarfies cooked in milk
   - Wild rice
   - Rice with raisins
   - Hominy grits
   - Ralston
   - Wheatsworth

Refer to *Practical Cookery*, "Cereals," pp. 25–28; Heseltine and Dow, *The Basic Cook Book*, "Breakfast Cereals," pp. 100–104. Recipes not included in these references are to be supplied by the instructor.

PROBLEM 3 *How shall starchy sauces and desserts be prepared?*

Sauces played a prominent part in the cooking of medieval times, as many dishes, we are told, "owed most of the character they had to the sauce." "Our ancestors, as we have found, did not highly esteem simple dishes, and a cook of any reputation aimed as far as possible . . . to transform one thing into another quite different, since as a rule it was beneath his dignity to offer food that had cost but slight effort. The most effective way to remove the stigma of simplicity . . . was to employ a sauce made hot with spices and condiments."[1] Some of the sauces were thickened with flour, others with broken bread, and some with eggs. The French are regarded as having fostered the use of sauces, and are said to have some three score and more sauces, carefully listed as to appropriateness for serving with certain foods. America can scarcely boast of a dozen in common use. The importance of white sauce and its variations in American cookery was stressed by Brillat Savarin when he said of America, "One hundred religions, and only one sauce."

White sauces, gravies, cake and dessert sauces, fruit tapioca, blanc manges, and a wide variety of other desserts are thickened with starchy agents. Those commonly used include cornstarch, flour, arrowroot, tapioca, rice, and other cereals. Waxy rice, sorghum, potato and sweet potato starches are used to a limited extent either because they are readily available or are especially suited to certain cookery processes.

Starchy thickening agents. Cornstarch is probably more widely used in the American home as a thickening agent than is any other starch. It has certain advantages over others. It is obtained readily from maize and hence is inexpensive. It is practically lacking in flavor and cooks to an almost clear paste in water or other clear liquids. When properly combined with the liquid, it is smooth and homogeneous, thickening the liquid without lending any distinctive character to it.

Wheat starch is little used in food preparation, but wheat flour is extensively used as a thickening agent. Flour has less thickening power than

[1] W. E. Mead, *The English Medieval Feast*, Boston: Houghton Mifflin Company, 1931, pp. 96–97.

cornstarch. It makes an opaque jelly rather than a clear one; yet its characteristic flavor is preferred by many to that of other thickening agents. Both hard and soft wheat flour are used for this purpose, the soft wheat flour giving a sauce with characteristics in between those thickened with cornstarch and hard wheat flour.

Arrowroot starch is obtained from the rhizome or rootstock of the maranta plant and a few related species grown in the West Indies. It resembles cornstarch in being white, fine, and powdery. When heated in water in certain proportions, it thickens to form a jelly. Although used in limited quantities in the preparation of food, it is unsurpassed as a thickening agent in such dishes as blanc manges. It is also considered more desirable for gravies, sauces, and pastries than some of the more common starches.

Rice starch or flour is used mainly by persons who are allergic to wheat. Recently the value of waxy rice flour in preventing the curdling of frozen sauces has been discovered. Today, this starchy agent is assuming importance in certain industries.

Potato starch, although extensively used abroad, finds limited use in this country in food preparation.

Tapioca is made from the starch obtained from the roots or tubers of the cassava or manioc, a woody tropical plant native to Central America. The starch, known as tapioca flour, rarely appears on the market as such. The tapioca of commerce is prepared from a dough made of the tapioca flour. When pearl tapioca is to be made, the moist dough is forced through a sieve, the size of the sieve determining whether the pearls will be coarse, medium, or fine. The little pellets are then subjected to a high temperature. Flake tapioca is made by baking the moist starch in thin sheets. Usually these sheets or flakes are ground to give the "minute" or granular tapioca. Pearl tapioca requires soaking for at least an hour before using; hence the granular tapioca which requires no soaking is more popular.

Rice and other cereals used in desserts are valued both for their high starch content and for the characteristic flavor and consistency they give to the dessert. Bread, cake, and cooky crumbs are also used, although the method of using them is somewhat different from that of using the raw starches.

Preparation

Fine starches, like granular breakfast cereals, offer a problem in uniform cooking. They lump even more readily than cereals, so must be mixed with care. Here again a smooth, even paste or gel is obtained only when

each granule comes in contact with the liquid and the swelling is uniform. To insure even cooking, the granules must be separated before the hot liquid is added. Water or another substance is mixed with the starch as a means of doing this. In sweet sauces and desserts, the sugar is commonly mixed with the starch. For non-sweet mixtures, creamed fat, melted fat, or a small amount of cold liquid is combined with the starch. The liquid, either hot or cold, is then added and the mixture is cooked. At a certain temperature, the starch swells rapidly and becomes translucent or clear. Studies show that cornstarch reaches its maximum translucency at 86° or 87° C. (187° or 189° F.). However, a 5 per cent starch solution cooked to this temperature gives only a weak gel, which is granular and shows some syneresis or separation of liquid from the gel. When the paste is cooked to a temperature only a few degrees higher, 95° C. (203° F.), a well-formed gel results. This shows the necessity of heating sauces, desserts, and other foods high in starch to a temperature above the point where the starch becomes clear or translucent if the maximum swelling is to take place. Studies of food temperatures indicate that most foods high in starch reach a temperature of 95° C. (203° F.) or above during cooking. There seems little danger of undercooking starches from the standpoint of gelation. Flavor is generally considered to be improved with a longer cooking period, so white sauces, gravies, and similar dishes are as a rule cooked for a short period after thickening occurs. In the case of cornstarch desserts, it is sometimes recommended that the dessert be cooked fifteen or twenty minutes after it is thickened in order that the best flavor may be developed and that no raw starch flavor remain. However, much overcooking of the coarser agents is undesirable. Tapioca becomes gluelike when overcooked, and rice may cook to a uniform mass, thus losing its characteristic appearance. Each thickening agent has definite thickening power and is used for certain dishes, although one may be substituted for another in many instances. The proportion necessary depends largely upon the use for which the sauce is intended or upon the type of dish desired. The texture varies with the nature of the thickening agent used.

The addition of acid to a mixture thickened with starch may greatly affect consistency. When acids are present, some hydrolysis of the starch occurs and this decreases the viscosity.

Sucrose also affects the consistency of mixtures thickened with starch. If the concentration of sucrose is great it may even cause a starch mixture which would otherwise have formed a gel to become a syrupy mass.

As used for sauces and puddings, the following amounts of thickening

TABLE 21. PROPORTIONS FOR WHITE SAUCES *

Types	Proportions for Making				Uses	Proportions for Use
	Liquid	Thickening Agent	Fat	Seasoning or Flavoring		
Very thin	1 c. milk	½ T. flour	1 T.	½ t. salt	Cream soups made from starchy foods	Allow ¼–1 cup cooked, strained vegetable or other pulp to 1 cup sauce. The average amount is ½ cup.
Thin.	1 c. milk	1 T. flour	1 T.	½ t. salt	Cream soups made from non-starchy foods	
Medium	1 c. milk	2 T. flour	2 T.	½ t. salt	Creamed dishes Scalloped dishes Gravies	Allow 1–2 cups vegetable, meat, or fish — cut into suitable pieces — to 1 cup sauce for creamed or scalloped dishes.
Thick.	1 c. milk	3–4 T. flour	2 T.	½ t. salt	Soufflés	Allow 3 eggs and from ¾–1 cup other food material to 1 cup sauce.
Very thick. . . .	1 c. milk	4–5 T. flour	2½ T.	½ t. salt	Croquettes	Allow 1–3 cups finely divided food materials to 1 cup sauce.

* Adapted from **Practical Cookery and the Etiquette and Service of the Table**, John Wiley and Sons.

agents are considered approximately equivalent: one half to three fourths tablespoon of cornstarch, one tablespoon of granular tapioca, two tablespoons of pearl tapioca, one fourth to one half cup of stale bread or cake crumbs (this varies with dryness), one tablespoon of flour, two tablespoons of light browned flour, four tablespoons of dark browned flour, one and one half to two tablespoons of uncooked rice, one half to one cup of steamed rice (dry), and two tablespoons of granular cereals.

White sauce may be considered a basic sauce. From it a wide range of savory sauces can be made by varying the liquid and seasonings used. A medium white sauce for creamed vegetables and other creamed dishes should be the consistency of thick cream; hence it is frequently called cream sauce. Table 21 shows the uses and proportions of the different types of white sauces.

Gravies closely resemble medium white sauce, the chief difference being that drippings are used as the fat and often browned flour is preferred. When browned flour is used, cognizance must be made of the reduced thickening power due to the dextrinization of the starch.

Starchy desserts are commonly named according to the thickening agent and flavoring used. Cherry tapioca is, as the name implies, a dessert of cherries thickened with tapioca. Chocolate cornstarch pudding contains milk, chocolate, cornstarch, and sugar. Cornstarch pudding is frequently called blanc mange, from the French phrase meaning "white eating." Originally blanc manges were thickened with other forms of starch as well as with Irish moss, but now the terms blanc mange and cornstarch pudding are for the most part used interchangeably.

As with the sauces, a great variety of desserts can be made from one foundation recipe by varying the liquid, flavorings, and foods added. Definite proportions of thickening agents give certain consistencies, the amount used depending upon the type desired. These are shown in Table 22. If other thickening agents are used, equivalent amounts may be substituted for the cornstarch.

TABLE 22. PROPORTIONS OF CORNSTARCH REQUIRED FOR DESSERTS OF DIFFERENT CONSISTENCY

Type	Amount Liquid	Amount Cornstarch
Sauce	1 cup	½–¾ T.
Cup dessert	1 cup	1–1½ T.
Small mold	1 cup	1½ T.
Large mold	1 cup	2–2½ T.

The standard recipe may be varied. Careful examination of simple desserts shows that many variations may be made from one basic recipe. Take, for example, a cornstarch pudding or a blanc mange. Table 23 shows some variations which may be made using only starchy thickening agents.

TABLE 23. COMMON VARIATIONS OF CORNSTARCH PUDDING

Product	Liquid	Starchy Agent	Sugar	Other Ingredients
Plain blanc mange	1 c. milk	1½–2 T. cornstarch	2 T.	½ t. vanilla
Chocolate blanc mange	1 c. milk	1½–2 T. cornstarch	3 T.	½ sq. chocolate ¼ t. vanilla
Chocolate cream pudding	1 c. milk	1½–2 T. cornstarch	3 T.	1 stiffly beaten egg white ½ sq. chocolate ¼ t. vanilla
Coconut blanc mange . .	1 c. milk	1½–2 T. cornstarch	2 T.	½ t. vanilla ½–1 c. shredded coconut
Fruit blanc mange	1 c. milk	1½–2½ T. cornstarch	2 T.	½ c. dates, pineapple, bananas, cherries, prunes or other desired fruit
Nut blanc mange	1 c. milk	1½–2 T. cornstarch	2 T.	½ t. vanilla ¼–½ c. chopped nuts
Caramel blanc mange .	1 c. milk	1½–2 T. cornstarch	2 T.	½ t. vanilla 2 T. caramel syrup
Maple blanc mange . . .	1 c. milk	1½–2 T. cornstarch	2 T. maple sugar	
Fruit tapioca	1 c. fruit juice and water	2–2½ T. minute tapioca	3 T.	½–1 c. fruit
Indian pudding	1 c. milk	1 T. cornmeal	1½–2 T. molasses	¼ t. ginger

Service. The method of serving sauces and desserts adds to or detracts from their acceptability. No matter how delicious a sauce is, it remains an accessory to the main food. Creamed vegetables, meats, or fish should include only enough white sauce to add flavor and to bind the foods together. The white sauce is not used as a means of extending an inadequate supply. Likewise the consistency of the sauce is a factor. Creamed dishes with the consistency of soup are undesirable, as are also those that are stiff enough to hold their shape.

Desserts are more attractive when garnished. A plain blanc mange is made more acceptable by garnishing with a fruit sauce or a spoonful of whipped cream sprinkled with bits of maraschino cherry or bits of candied ginger. Slices of fruit, nuts, or coconut make attractive garnishes for starchy desserts. The serving should not be too large. A medium-size serving is best. The moderately stiff desserts, or those that are readily cut with a spoon, are more desirable than stiff ones.

ACTIVITIES

1. Prepare and evaluate the following starchy desserts which contain no eggs:
   - Cherry tapioca
   - Apple tapioca
   - Peach tapioca
   - Blackberry tapioca
   - Chocolate blanc mange
   - Date blanc mange
   - Nut blanc mange
   - Coconut blanc mange
   - Caramel blanc mange
   - Rice butterscotch
   - Indian pudding
   - Baked rice pudding
2. Prepare and evaluate starchy sauces suitable for serving with cake, fruit, puddings, or meat, such as lemon sauce, vanilla sauce, chocolate sauce, and raisin sauce.
3. Prepare and evaluate white sauces suitable for cream of carrot soup, cream of tomato soup, creamed new peas, spinach soufflé, and salmon croquettes.

Refer to *Practical Cookery*, "Sauces" and "Desserts," pp. 92–97, 160–168; Heseltine and Dow, *The Basic Cook Book*, "Sauces," pp. 310–326; "Desserts," consult index.

Recipes not included in these references are to be supplied by the instructor.

Beverages

In medieval England the term beverages would have referred to wines, ales, and beer. They had no distilled liquors; nor did they know the satisfaction of tea, coffee, and cocoa, which have so large a part in present-day dining.

Tea

Tea was, perhaps, the first of our present common beverages to make its way into England. Long known and valued in the Orient, it was not introduced into England until the trade routes to far-away countries were opened.

For many centuries before that time, Chinese connoisseurs had appreciated the superiority of a *pale* cup of tea, tea so delicate that its delicious flavor would pass unnoticed in a busy or noisy place. For that reason the Chinese considered an atmosphere of quiet and seclusion, where only three or four persons were gathered together, a proper setting for the drinking of tea. Lin Yu-t'ang [1] tells how tea to these people symbolized earthly purity, and the handling of tea from the plant to the cup assumed something of the quality of a religious ceremony. Tea was prepared in a certain well-defined manner under conditions of greatest cleanliness by either the connoisseur himself or by specially trained servants and was made on stoves reserved for this purpose. When only three were drinking tea, one stove and one servant boy sufficed. If as many as five were drinking it, two stoves and two boys were required in order to avoid delays.

As used in England immediately after its introduction, tea was brewed so strong that it differed entirely from the beverage the Chinese enjoyed. But however it was made, its popularity spread, and by the time of Queen Elizabeth tea had become widely used throughout that land. Dr. Samuel Johnson described himself as a "hardened and shameless tea drinker who for twenty years diluted his meals only with the infusion of this fascinating plant, who with tea amused the evening, with tea solaced the midnight, and with tea welcomed the morning." Like Samuel Johnson, thousands of his fellow countrymen "welcome the morning" with a bracing cup of this beverage and indulge in a four o'clock repast named in its honor, thus giving to tea an important place in the daily diet of the English people.

[1] Lin Yu-t'ang, *The Importance of Living.* New York: Reynal and Hitchcock, 1937.

Though tea is used less in America as a morning beverage and the custom of afternoon tea is far from common, enough tea is used in the United States to make it an important food import. An estimated 93 million pounds were imported in 1952.[1]

The large number of teas on the market vary widely in quality. Not only are there different varieties of tea plants, but the tea from each kind of plant differs in quality, depending upon the locality, the weather, the composition of the soil, the time of picking, the care exercised in the selection of the leaves, and the method of curing. The leaves from one part of the plant differ from those from another, the grade being largely determined by their location. The young unopened leaf buds at the end of the shoot are considered the highest in quality and command the highest price. The first and second leaves are of good quality; the third and fourth are of progressively poorer quality. It takes approximately 3200 shoots to make a pound of processed tea.

The kind of tea, whether black, green, or oolong, is determined by the treatment after picking. When black tea is to be made, the leaves are fermented before drying. This is actually an oxidizing process which darkens the leaves and softens the flavor. When green tea is desired, the fermentation process is omitted. Green tea is more astringent in flavor than black. Apparently the fermentation renders a substance in the tea known as tannin less soluble, thus mellowing the flavor. Oolong tea is semi-fermented. It is preferred by many, as it combines the properties of black and green tea. Regardless of the earlier treatment to which the leaves have been submitted, in the final process before packing, the leaves are steamed, rolled, and dried. Scented or flowered teas, such as jasmine tea, can be made from green, black, or oolong tea by the addition of blossoms in layers after the tea has been fired. The combination is then heated.

Only the soluble substances in the tea leaves are found in the infusion or beverage. These include theine or caffein, tannin, coloring substances, and volatile oils. The amount of these substances present in the beverage depends largely upon the method of making. If tea is brewed for a short time, only a small part of the theine may be extracted. Long brewing extracts more of the theine as well as larger quantities of the tannin, which is responsible for the bitter taste of some tea. Coloring substances vary with the kind of tea. A cup of black tea of medium strength may be quite dark in color, whereas a strong brew of green tea may be almost colorless. The essential oils help to give tea its characteristic flavor.

[1] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

The caloric value of a cup of tea depends upon the sugar and cream added. Tea contains a stimulant which, upon certain individuals, may exert a definite physiological effect. The stimulating factor in tea, first called theine, was later found to be identical with caffein in coffee. Though the percentage of theine in tea is greater than that in coffee, because of the difference in the mode of preparation and relative strength of the two as served, a cup of coffee is more stimulating than a cup of tea.

Coffee

Coffee was introduced into England by way of the Continent some decades after tea was in rather general use. Like tea, it was introduced only after adventurous explorers brought back knowledge of the bean and the custom of drinking this beverage from the distant lands of Arabia, Africa, the Indies, and Central America.

Though coffee is native to Africa, its cultivation is now widespread, more than half of the world's crop being produced in Brazil. The United States consumes more coffee than any other nation. The average per capita disappearance of coffee in 1951 was 16.3 pounds.[1] Coffee produced in one country differs from that produced in another because of different soils, altitudes, and climates. There are different varieties of coffee, too,

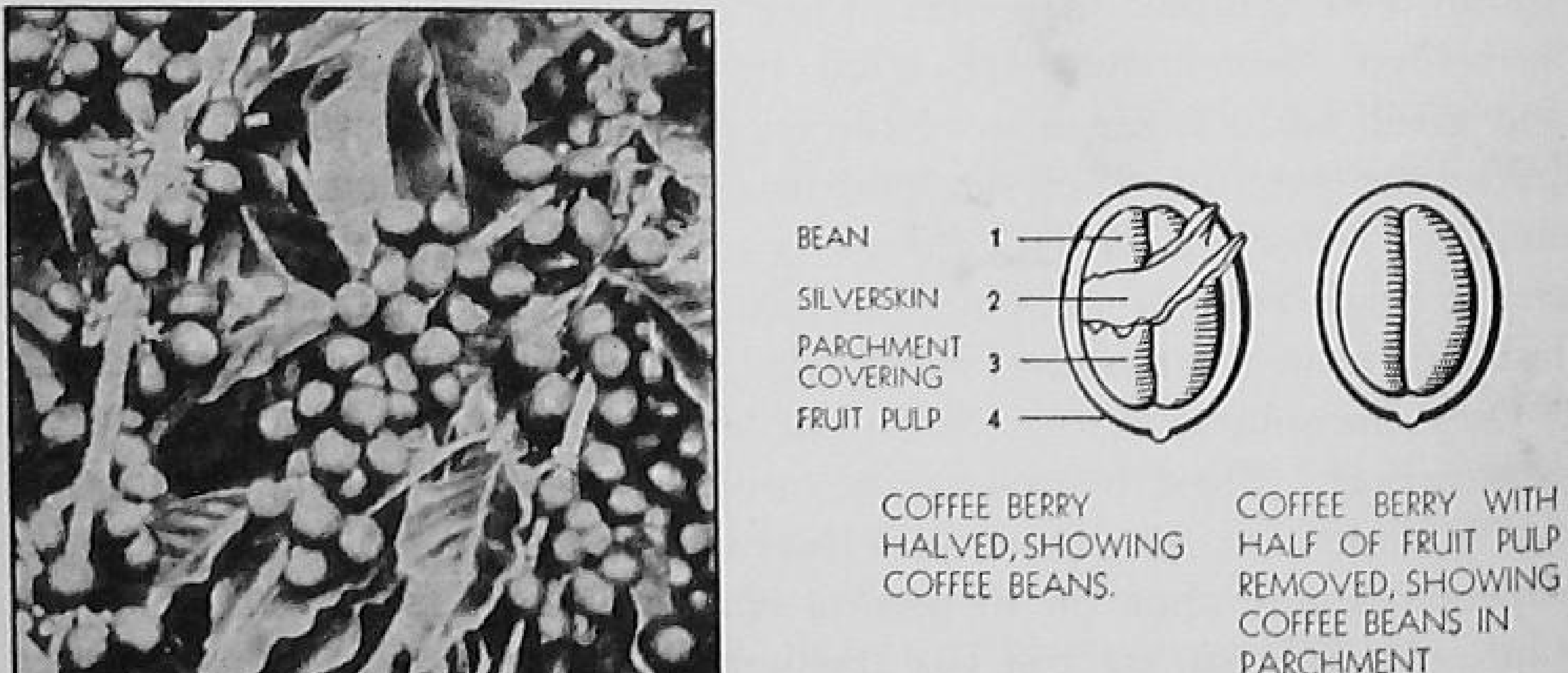


Fig. 34

Coffee beans, well protected by three coverings, grow close to the branch on the coffee tree.

[1] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

which vary in flavor and desirability. However, present-day blends have so disguised the characteristics of any one variety that the consumer can no longer discern easily a predominating variety in his purchase.

Coffee is the berry or bean of the coffee tree. The berry, at first green, turns red as it matures and when ready for harvesting becomes a deep purplish red. The berry ordinarily consists of two oval beans, a little less than one centimeter in diameter, enclosed first in a "silver skin" and then in another skin called the "parchment," the whole being surrounded by the flesh or pulp of the fruit.

The first step in preparation for market is picking, which, for the most part, is done by hand. Over-ripe berries shrink, hence careful timing of the picking is important. The next step is the removal of the pulp. If water is plentiful, the pulp is crushed and removed by a series of washings. The washed beans are dried and then "hulled and peeled," which means the parchment and silver skin are removed, generally by "milling." When water is scarce, the berries are dried and the pulp, parchment, and silver skin removed in one operation. The beans are next cleaned to free them of the skins, dirt, and sand. They are then ready for grading, packing, and shipping to the various markets of the world.

Before coffee is ready for the retail market it must be roasted. This process requires expert care, for either over- or under-roasting greatly injures the quality of the bean. The roasting brings out the full flavor of the coffee. Gases are liberated, much water is lost, the aromatic oils are developed, and the carbohydrates are more or less caramelized.

The important components of coffee, from the standpoint of beverage-making, are probably the caramelized carbohydrates, carbon dioxide, tannin or caffetannic acids, caffein, oils and fatty substances, and caffeol. The caramelized carbohydrates are largely responsible for the brown color of the drink and contribute to its flavor. The carbon dioxide held in the roasted berry is said to be so closely related to the caffeol that the loss of carbon dioxide is accompanied by loss of flavor. The tannin of coffee, like the tannin of tea, may produce a bitter flavor, since tannin is much more soluble in boiling water than in water just below the boiling point. Caffein, the stimulating property of coffee, is exceedingly soluble in water. The beverage, unless made from decaffeinated coffee, contains this substance. Caffeol is probably largely responsible for the aroma of coffee and contributes to its flavor. It is closely associated with the oils and fatty substances of the coffee bean and has frequently been confused with them. It is soluble in water and is rather volatile. Coffee, after grinding, undergoes a loss of flavor and develops staleness if exposed to the air. As a

result, much of the coffee on the market today is packed in airtight containers with the air exhausted. Hence the coffee in the can is surrounded by the gases which have escaped from it. In the process of brewing coffee, the caffeol tends to escape with the steam, giving the familiar aromatic odor.

Coffee substitutes, usually made from roasted ground cereals or vegetables and caffein-free coffees are available for those who prefer them.

Soluble or "instant" coffee and frozen coffee concentrates are increasingly common. Some believe that using soluble coffee will save money but without doubt the flavor and aroma differ from the freshly brewed beverage. The desire for a cheaper beverage has lead to increased interest in coffee extenders, including coffee substitutes, chicory, and a preparation said to contain caramelized starch and calcium phosphate. Opinions vary as to the acceptability of these extenders.

Chocolate and cocoa

Chocolate and cocoa are beverages originating in the New World. Their use in the West Indies and in Mexico was common before the discovery of these countries by European nations. Both are manufactured from the cocoa bean, the seed of a fleshy fruit, which grows on a tree the botanical generic title of which is *Theobroma*. When translated this becomes "food of the gods," an indication, at least, of the esteem in which these products were held.

The cocoa beans are encased in fleshy pods from seven to twelve inches long, each pod containing thirty to forty beans. The thoroughly ripened pods are gathered and dried for twenty-four hours, after which they are cut open and the beans are removed. The beans undergo a series of processes, including fermenting or sweating, removing the pulp, washing, drying, and roasting. The shells are cracked and the kernels broken into pieces known as "cocoa nibs." The cocoa nibs are separated from the shells and are heated and ground. The result is plain or bitter chocolate. If cocoa is to be made, part of the fat is removed and the resulting mixture again is ground, giving a dry powder. Various other substances, such as spices, flavorings, sugar, and milk powder, may be added to give variety.

Chocolate and cocoa contain appreciable amounts of fat and carbohydrate. The fat content of chocolate is often more than 50 per cent and that of cocoa less than 8 per cent. Theobromine, the substance in chocolate and cocoa which resembles caffein, is said by Macleod and Nason [1] to have no physiological effect.

[1] Annie Louise Macleod and Edith H. Nason, *Chemistry and Cookery*.

Top photo, Ewing Galloway
Lower photo, courtesy of Hershey Chocolate Corporation

Fig. 35

The pods of the cocoa tree are from seven to twelve inches long and grow close to the trunk or main branches. Within the pod the beans are attached to a central stem.

Cocoa "processed with alkali," formerly termed "Dutch process cocoa," differs from regular cocoa. The use of the alkali gives a red color somewhat darker in value, removes a part of the flavor, and tends to prevent "settling out" of the cocoa in the beverage. This latter characteristic has led to the mistaken belief that cocoa thus treated is rendered more soluble.

PROBLEM 4 *How shall beverages be prepared?*

Tea

Making tea is a simple process. A few rules carefully followed will result in a delightful and pleasing beverage. The use of attractive and colorful teapots in the process enhances the satisfaction of tea-making. In this country a teapot of glass, pottery or porcelain is preferred, although for more elaborate service, one of silver may be used. Pots of other metals are widely used in some countries but here they are thought by some to affect the flavor and they do not hold the heat well. Heat is necessary for a good infusion. Scalding the pot to freshen and heat it is the first step in making tea. Then a measured quantity of tea leaves, preferably enclosed in a tea ball, a cheesecloth or paper bag, or a strainer, are placed in the pot. The container should not be filled more than one half full, since it is necessary to allow for the swelling of the leaves. Freshly boiling water is added and the pot is tightly covered to prevent the escape of steam laden with essential oils responsible for the characteristic flavor. It is then set in a warm place and allowed to steep for one to five minutes. If the leaves are in a container, lift them from the beverage as soon as the desired strength is reached. If the tea is added loose, two pots are desirable so that the beverage may be strained into a second hot pot as soon as it has steeped sufficiently after which the beverage is ready for immediate service. Its strength may be regulated by the addition of freshly boiling water, which may be added from a kettle at the table. Boiling of tea is undesirable, as it results in increased losses of essential oils as well as in the extraction of a greater proportion of tannin. Tea has the best flavor immediately after it is made. Allowing it to stand for any length of time lowers the quality of the beverage.

Tea is commonly served with sugar, cream, or thinly sliced lemon or orange. Sometimes crystal mints, candied ginger, or cloves are added.

Courtesy of Sunset Magazine

Fig. 36

Tea at its best is carefully prepared and attractively served.

Coffee

The utensil in which coffee is made is considered important by many people. It is said that when metals such as aluminum, tin, nickel, or copper are used, there is much greater danger of an astringent or a bitter taste than when glass, earthenware, stainless steel, enamelware, or porcelain is used. However great numbers of aluminum coffee makers of every type are on the market and other metals are used also. Coffee may be made by any one of four methods, depending upon the utensil available and the preference of the individual. "Boiling" is perhaps the oldest method,

though this has been largely replaced by percolation, which in turn is yielding to the drip or filtration method and the so-called vacuum method.

In making coffee, even so-called "boiled coffee," the water should be maintained below the boiling point. Boiling the beverage results in great extraction of the tannin and in excessive loss of the caffeol. For "boiled coffee," the coffee may be placed directly in the water or first enclosed in a cloth bag. The water is held just below the boiling point until the flavor is extracted. Settling or clarifying the beverage is facilitated by the use of egg shells, egg white, or a dash of cold water at the close of the cooking process. When egg is used it is mixed with the dry coffee before the water is added. As it coagulates it encloses the minute particles of coffee, which are responsible for the muddy appearance of the unclarified beverage. In a series of experiments carried on at the University of Kansas to determine the best way to make coffee, that commonly designated as "boiled coffee" clarified with egg was rated second.

When coffee is made by percolation, the coffee of medium or "regular" grind is placed in a perforated container held in the top of the pot. The water is forced by heat through a central tube to the top of the pot, where it is sprayed over the coffee and extracts the soluble materials as it drips through the grounds. When this method is used, the ground bean does not come in contact with the boiling water, but unless care is exercised the beverage boils and the flavor is thus partially lost. Some electric percolators are so constructed that the water never reaches the boiling point. Others must be watched to see that lower temperatures are maintained. Even with great care some flavor is lost during the continual aeration attendant upon percolation. The beverage thus made is, as a rule, sparkling and clear, requiring no clarifying.

Drip or filtered coffee is made by pouring the boiling water through finely ground or powdered coffee held in a fine-meshed container. The container in some pots is fine enough to act as a filter and prevent the passing through of the fine coffee grounds. However, when powdered coffee is used, filter paper or cloth is necessary. The water should be poured over the coffee only once to obtain the greatest amount of flavor and the least tannin in the beverage. The comparatively short time the water is in contact with the coffee makes it imperative that the bean be finely ground so that as much surface as possible is exposed in order to have the maximum of soluble substances extracted.

The vacuum coffee-maker is widely used at the present time and is considered by many to be an improvement over other utensils. The coffee-

maker most frequently used consists of two glass containers, but when more durable equipment is desired, they may be of stainless steel or aluminum. One container has an opening like a jar; the other is more or less funnel-shaped and has a hard-rubber ring fastened around the tube at the base. This rests in the opening of the first container, making a tight connection between the two. The top of the tube is closed by means of a filter, which may be of glass, fabric, or other material. Water is placed in the bottom container and finely ground coffee in the top. The water is heated and the pressure of the steam formed forces the water into the upper container. The coffee-maker is then removed from the heat and the beverage is drawn back into the lower bowl due to the vacuum resulting from cooling.

Each method of making coffee has its advantages and each may result in an excellent beverage. Regardless of the method used the best results are obtained when the coffee is fresh and when it is a suitable grind for the method used. The equipment should be clean and with no evidence of a stale coffee odor. The coffee and water should be carefully measured and whenever timing is a factor it too should be carefully observed. And finally, the coffee should be served as soon as possible after made, for it loses flavor rapidly.

Coffee may be served black, with sugar and cream, or with hot milk. Cold milk should never be added, for it spoils the quality of the coffee. Very strong coffee served with an equal or greater amount of hot milk is called *café au lait*. That served double strength and black is frequently called *café noir* and is served in small cups after dinner. Hence, it may be called after-dinner coffee.

Chocolate and cocoa

Chocolate and cocoa differ widely from tea and coffee both in ingredients used and in the method of making. The chief liquid used in their preparation is milk, whereas water is used for tea and coffee. In making chocolate and cocoa the problem is one of incorporating the solid with the liquid rather than one of extracting the soluble substances.

Because chocolate and cocoa contain a fair amount of carbohydrate, the solid is combined with sugar and water and boiled until thick and glossy. This results in a less raw flavor and less tendency for the chocolate or cocoa to settle to the bottom of the beverage. The milk is then added and the whole mixture heated, after which it is beaten with a rotary egg beater to prevent the formation of a scum or to break up any scum that may have formed. Many believe that allowing the finished beverage to

stand over hot water for one half hour or more before serving improves the flavor. Others contend that no significant improvement results.

Chocolate and cocoa may be garnished with a marshmallow or with whipped cream. For breakfast they are preferably ungarnished.

ACTIVITIES

1. Compare beverages made from black, green, and oolong tea and from tea containing flowers such as jasmine or orange blossoms.
2. Prepare hot spiced tea.
3. Prepare coffee by the "boiled" method, by percolation, "dripolation," and by using the "coffee-maker." Clarify boiled coffee with egg white, egg shells, or a dash of cold water. Use coffee, all-purpose grind, and drip grind in making boiled and "dripolator" coffee. Compare the results.
4. Prepare after-dinner coffee and *café au lait.*
5. Prepare and evaluate chocolate and cocoa, using whole fresh milk; using dried whole milk; using a double portion of dried skim milk; using evaporated milk.
6. Prepare French chocolate. How does it differ from other chocolate?

Refer to *Practical Cookery*, "Beverages," pp. 17–24; Heseltine and Dow, *The Basic Cook Book*, "Beverages," pp. 76–99.

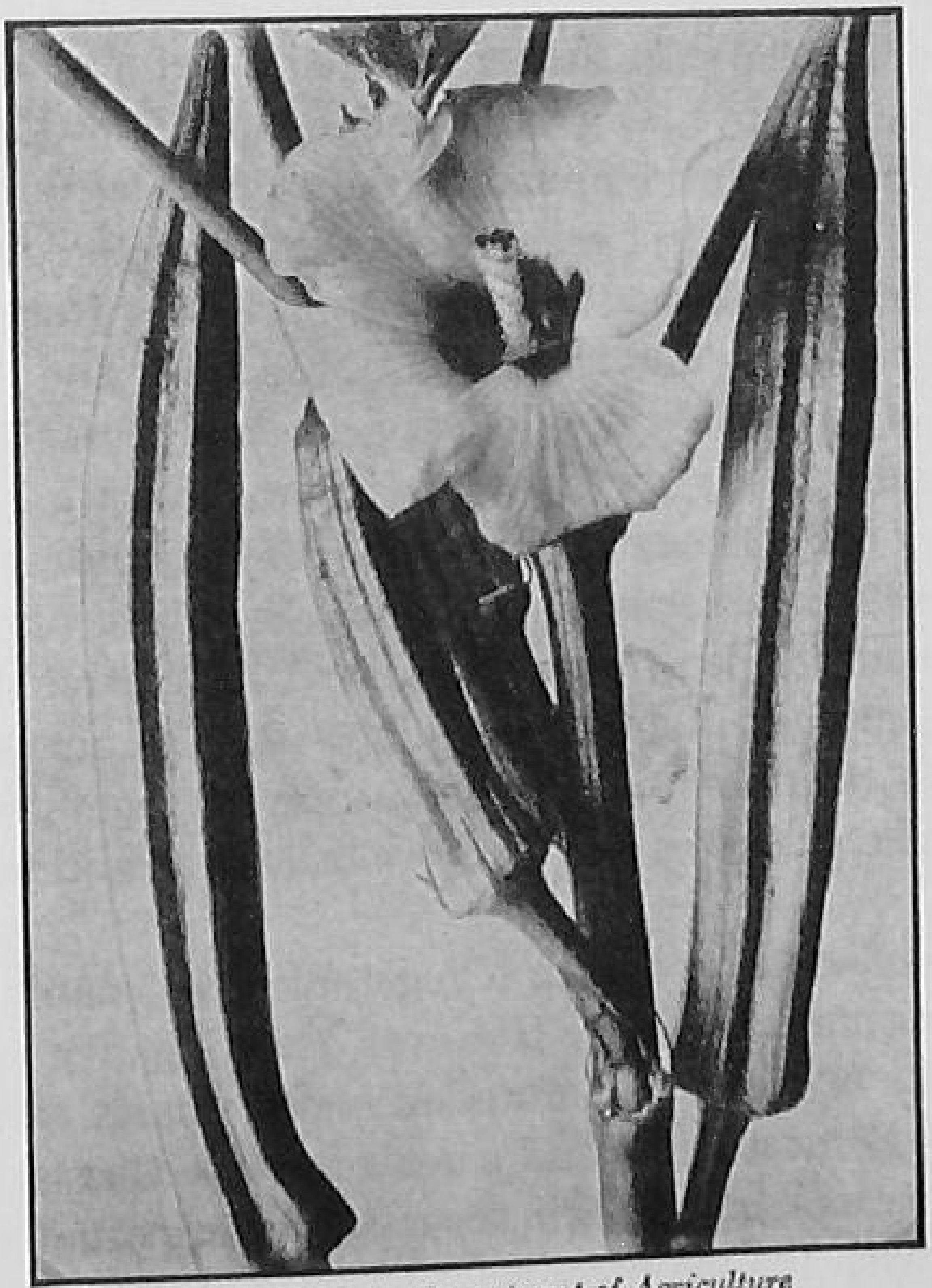
Recipes not included in these references are to be supplied by the instructor.

Vegetables

A century ago vegetables were regarded as of minor importance in the diet of the people of the United States. The number and the quantity produced in the home garden were limited, and few were purchased to add variety to the menu. Now, because of the improvement in production and in shipping, at least twenty kinds of vegetables are to be found during the year, even in the small market. The report of unloads of fresh fruits and vegetables in New York City for 1945 to 1949 shows that thirty-seven vegetables were handled every month in the year. Seasonal vegetables brought the number on the market at any given time well above this. General availability and increased knowledge of their nutritive value have no doubt contributed to the increased consumption of fresh vegetables. The trend was decidedly upward during the first half of the century as indicated by an apparent per capita consumption of fresh vegetables, including melons but not potatoes and sweet potatoes, — of 100 pounds

in 1909, 137 pounds in 1935 and 164 pounds in 1945 and '46. Since that time the consumption seems to have fallen off and in 1952 was estimated at 142 pounds per capita.[1] In 1945 the commercial pack of frozen vegetables in the United States was approximately 308 million pounds and in 1952 just under 896 million pounds.[1] This undoubtedly accounts in part for the apparent drop in consumption of fresh vegetables during that time, for the over-all consumption of vegetables — fresh, canned and frozen — remains at a high level. Tomato consumption increased slowly from 1909 to 1936; then it increased gradually until by 1945 it was 40 per cent greater than the 1909–36 average.

While an increase in the per capita consumption of tomatoes, leafy, green, and yellow vegetables and "other vegetables" was taking place,



Courtesy of United States Department of Agriculture

Fig. 37

Okra, a popular vegetable of the South, bears flowers and pods at the same time. Pod in the center is in prime condition for gathering.

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

there was a steady decrease in the consumption of potatoes from 184 pounds and of sweet potatoes from 25.8 pounds in 1909 to 101 and 6.6 pounds respectively in 1952.[1] Peas, once enjoyed for a brief month each summer, now are available either fresh or frozen during the entire year. Tomatoes, less than a century ago were regarded as "poisonous love apples," interesting because of color rather than possible utility. Today they are an important food, enjoyed and widely used the year round by increasing numbers of people, as the above figures show. The prejudice against turnips, once widespread in certain parts of the country, appears to be weakening gradually. Carrots were once considered as food for farm animals and as rabbit bait. Now their inclusion in the diet has become so general, and their preparation so varied, that the per capita consumption was given as 8.4 pounds in 1952.[2] Other vegetables have made similar gains.

Increased use of vegetables during the past quarter of a century has no doubt been influenced by: (1) greater understanding of their value in the diet; (2) specialization in the production of vegetables on a large scale in suitable areas; (3) breeding of vegetables with characteristics suited to the intended use whether canning, freezing or marketing fresh; (4) improved facilities for transporting and storing both the fresh and frozen products so they remain of high quality for longer periods of time; (5) careful selection, grading and labeling so the buyer knows just what he is getting; (6) prepackaging for convenience in buying; (7) expanding the market to include all areas and a large portion of, if not the entire, year; and (8) more money in the hands of the average consumer. Attractive displays and an ever-increasing number of fresh vegetables on the market tempt the average buyer to take home a generous supply of vegetables, some to be used raw as salads or relishes and many to be cooked and served in a variety of ways.

The foods included under the term vegetable are "plants or those parts of plants used for human food." However, the difficulty with this definition is that fruits and cereals are undoubtedly "parts of plants used as human foods," yet most fruits and cereals are not classed as vegetables. Vegetables occupy a certain place in the meal and are usually served, either cooked or raw, with the main course. Even so, there is no definite line drawn between vegetables, fruits, cereals, and nuts.

Vegetables are "plants or parts of plants," but only in a few cases is

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.
[2] *Consumption of Food in the United States 1909–52*, Agriculture Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

TABLE 24. COMPARISONS OF PER CAPITA CONSUMPTION OF SOME VEGETABLES*

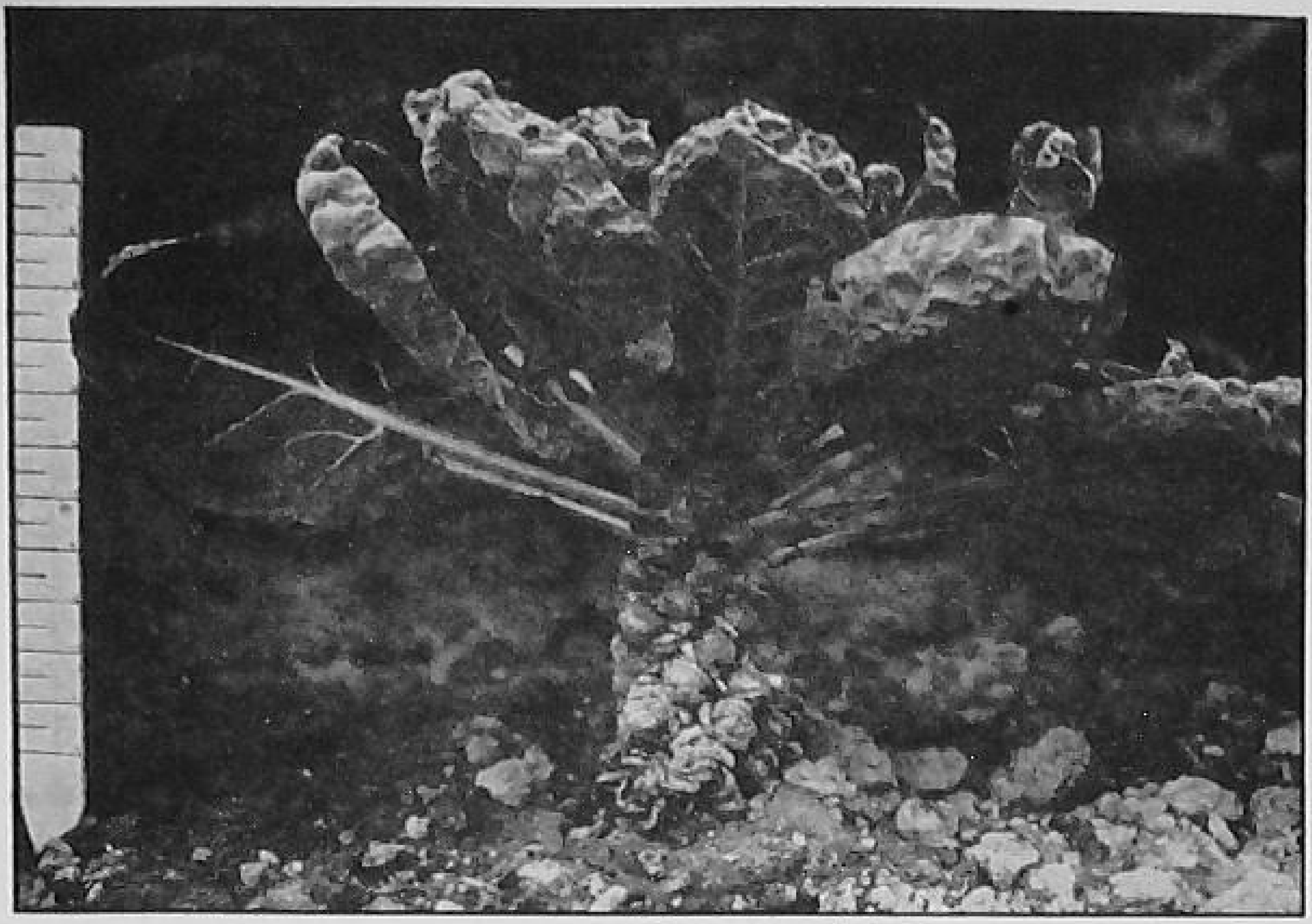
	1935–39 average Pounds	1947–49 average Pounds	1951 average Pounds	1953 average Pounds	1954 Preliminary average Pounds
Fresh	140	151	145	146	146
Canned	29.6	38.5	40.9	41.8	41.2
Frozen	.4	2.9	5.1	5.2	5.7
Potatoes	128	112	99	102	104
Sweet potatoes	21.3	12.3	7.0	8.3	7.2
Dry edible beans	8.7	6.6	8.0	7.7	8.4
Dry field peas	.6	.6	.5	.5	.4

* **The National Food Situation**, NFS 71, United States Department of Agriculture, February, 1955.

TABLE 25. PART OF PLANT EATEN

Leaf	Stem	Flower	Fruit	Seed	Stem Tuber	Bulb	Root
Brussels sprouts	Asparagus	Broccoli	Cucumber	Beans	Irish potato	Garlic	Beet
Cabbage	Celery*	Cauliflower	Eggplant	Corn	Jerusalem artichoke	Leek	Carrot
Chard		French artichoke	Okra	Peas		Onion	Parsnip
Collard			Peppers			Shallot	Radish
Cress			Pumpkin				Rutabaga
Dandelion			Squash				Salsify
Endive			Tomato				Sweet potato
Kale							Turnip
Lettuce							
Mustard							
Petsai							
Spinach							

* Celery is a leaf stem.



Courtesy of U.S. Department of Agriculture

Fig. 38

Brussel sprouts, resembling tiny heads of cabbage, grow close together on the main stock of the plant.

the entire plant eaten. Usually one part is most desirable, although there are exceptions. This part may be the leaf, stem, flower, fruit, seed, tuber, bulb, or root.

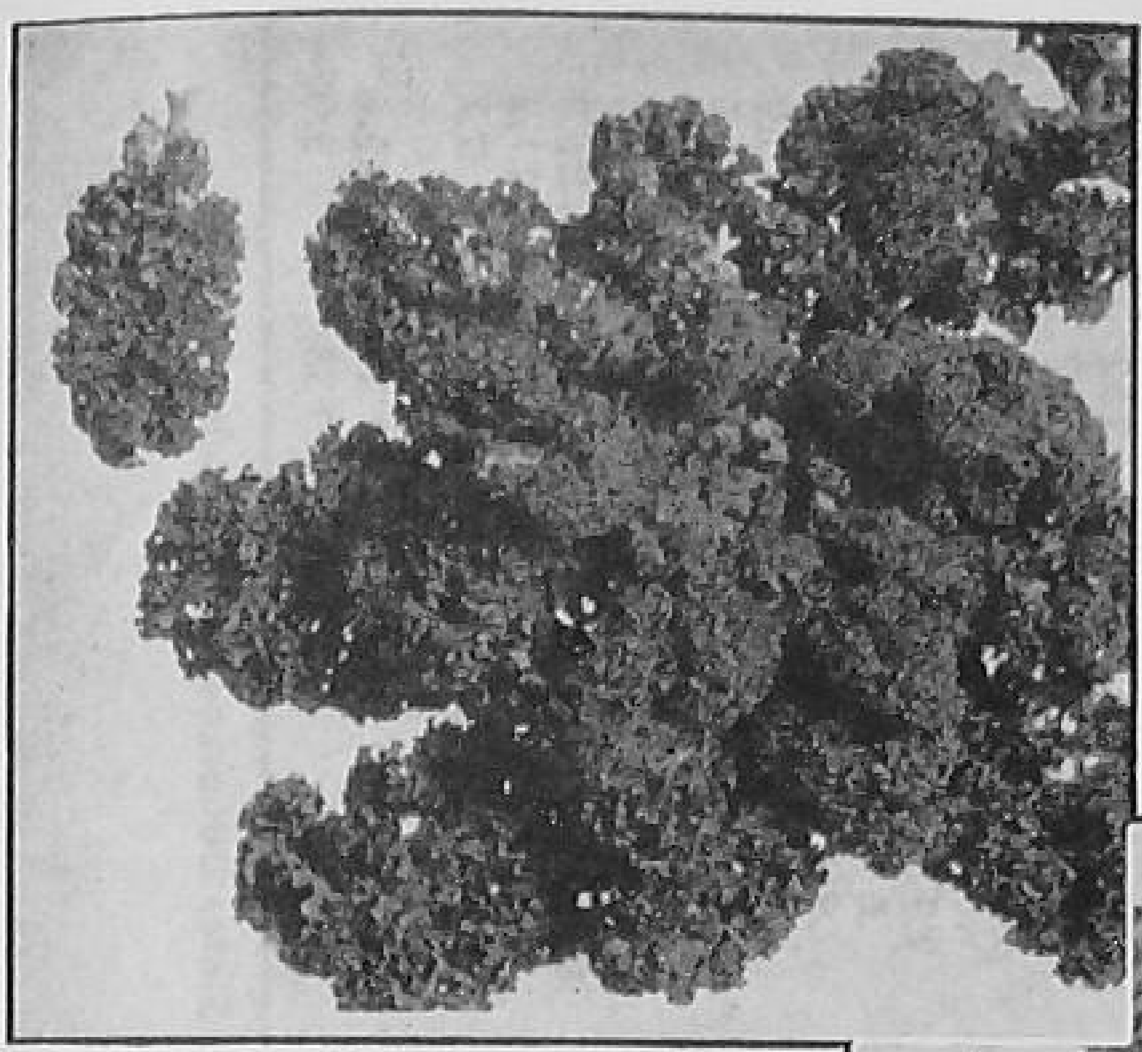
Nutritive value

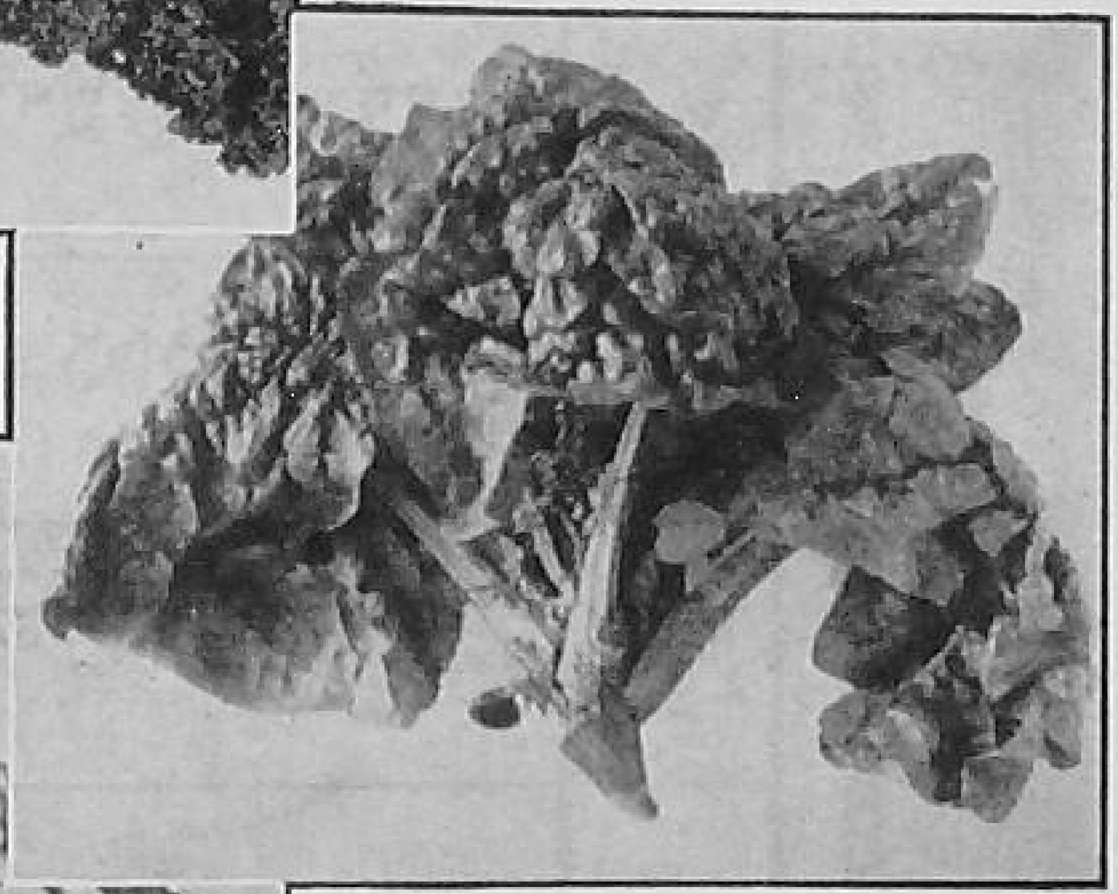
In general, the leafy vegetables are crisp, tasty, and colorful and are usually a better source of minerals and vitamins than other parts of the plant. Especially is this true of the vitamin A value, which is apparently formed in the leaf and from there reaches to different parts of the plant. The presence of this vitamin value is often associated with a bright green or yellow color. A comparison of the green and white leaves of head lettuce showed the green leaves to be almost thirty times as potent in vitamin A value as the white inner leaves. A study of New Zealand spinach showed the potency of the leaf to vary almost inversely with its size and thickness. Research has shown that the vitamin A value of green leaves is dependent upon their surface area. It seems, then, that if one would obtain the vegetables with the most vitamin A value, one should choose not only a leafy vegetable but one intensely green in color and, at least in the case of New Zealand spinach, with a thin leaf.

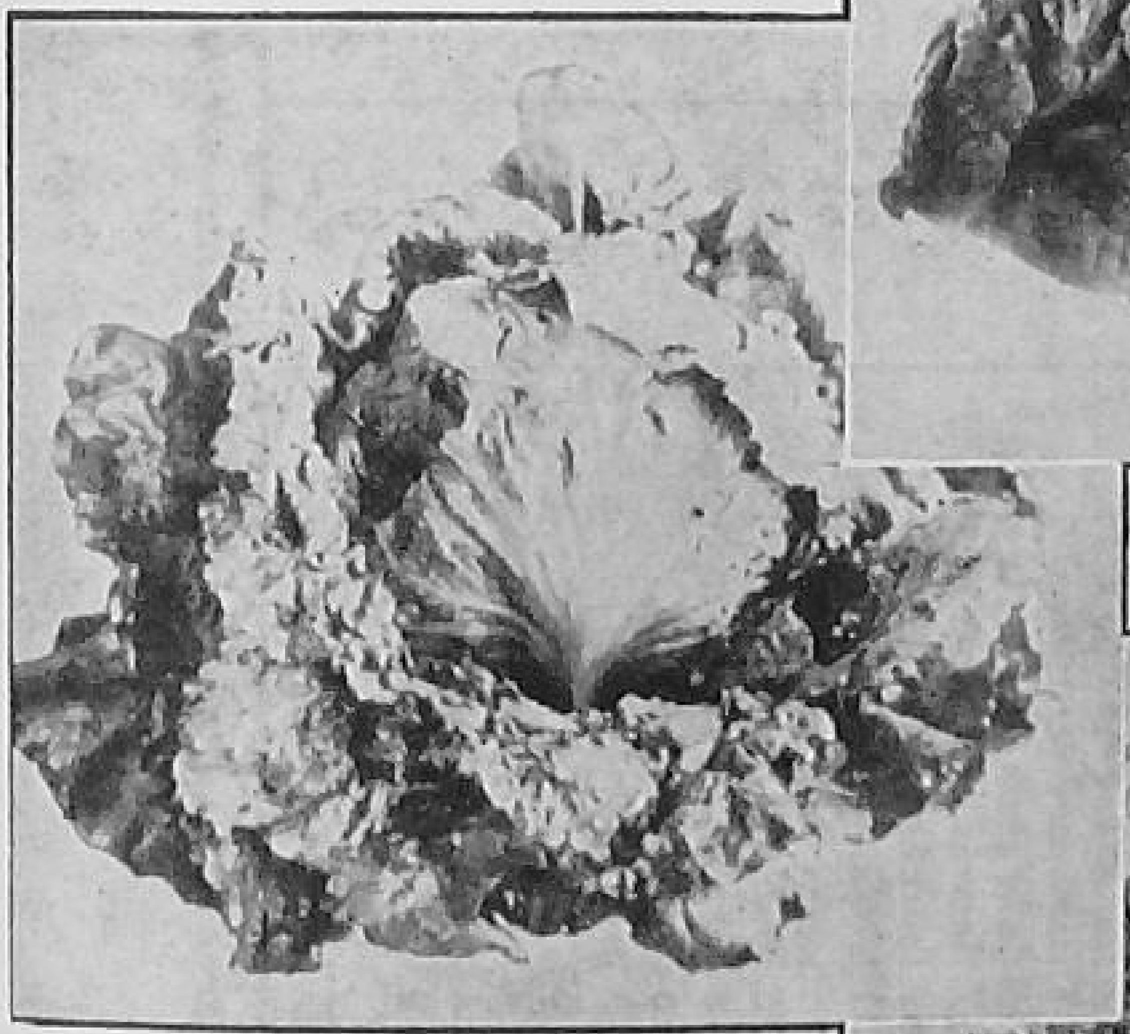
As sources of ascorbic acid, raw leafy vegetables compare favorably with

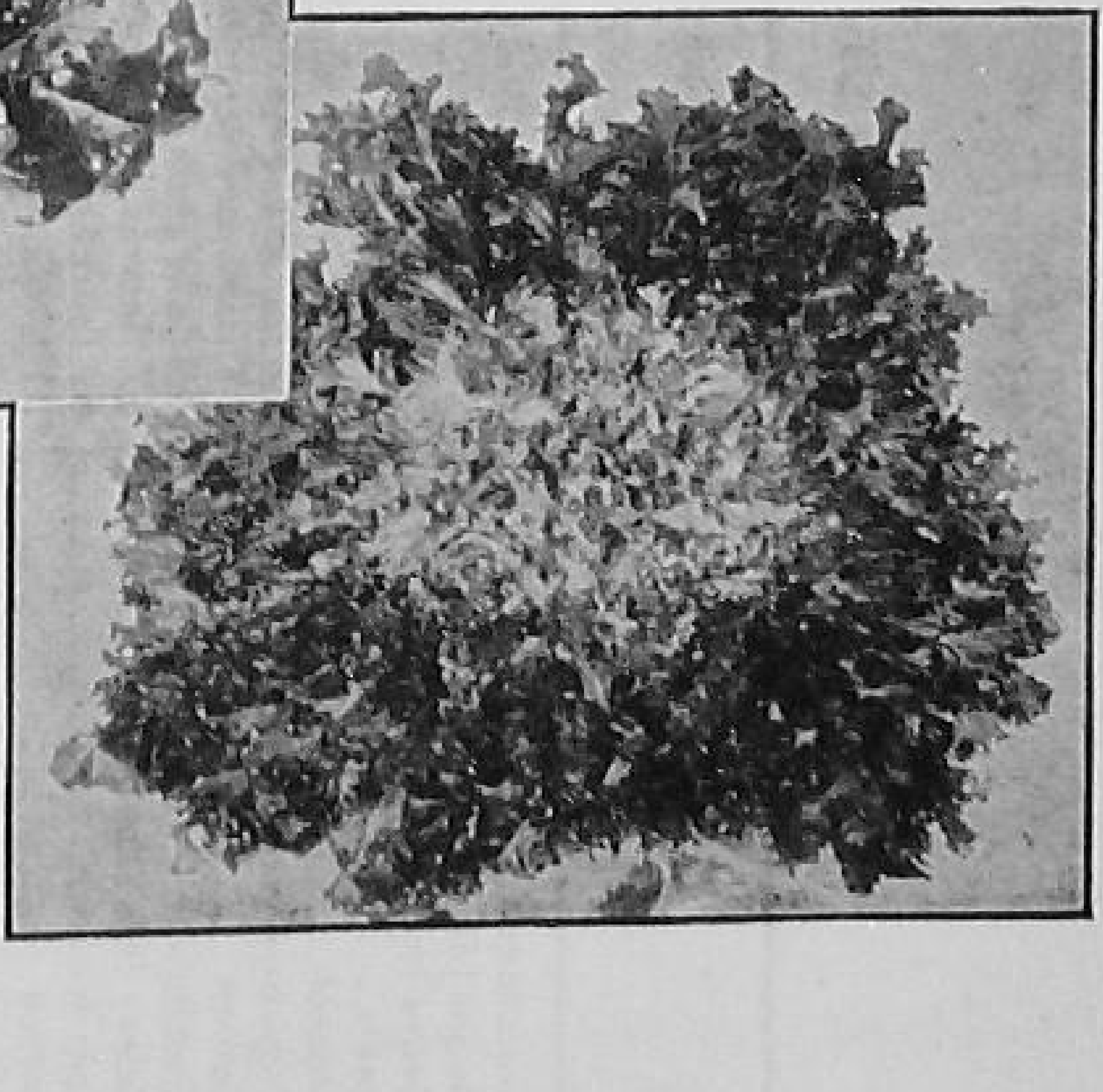
Fig. 39

Leafy green vegetables, highly prized for their vitamin and mineral content, are available in a wide variety of forms. From top to bottom: kale; spinach, Savoy type; iceberg lettuce; giant fringed endive.









Endive, courtesy of A. T. De La Mare Co., Inc. Others, courtesy of United States Department of Agriculture, Washington, D.C.

TABLE 26. COMPOSITION OF SOME COMMON VEGETABLES, ONE POUND AS PURCHASED *

Vegetable	Refuse Per cent	Food Energy Calories	Protein Grams	Fat Grams	Carbo-hydrate Grams	Calcium Milligrams	Iron Milligrams
Asparagus	25 (butt ends)	72	7.5	.7	13.3	71	3.1
Beans (dry, navy)	0	1,537	97.2	7.3	279.7	740	31.3
Beans (snap)	10 (ends)	143	9.8	.8	31.5	266	4.5
Beets	47 (tops)	101	3.9	.2	23.1	65	2.4
Broccoli	39 (leaves and tough stalks)	82	9.1	.6	15.2	360	3.6
Cabbage (small head)	27 (outer leaves and core)	80	4.6	.7	17.5	152	1.7
Carrots	37 (tops and scrapings)	119	3.4	.9	26.6	112	2.3
Cauliflower	55 (leaf stalk and main stalk)	51	4.9	.4	10.0	45	2.2
Celery (bleached)	37 (leaves and trimmings)	52	3.7	.6	10.6	143	1.4
Corn (sweet)	62 (husks and cobs)	160	6.4	2.1	35.5	16	0.9
Lettuce	31 (stalks and outer leaves)	47	3.8	.6	9.1	69	1.6
Onions, mature	6 (skins and rootlets)	193	6.0	.9	44.0	137	2.1
Peas (fresh)	55 (shells)	201	13.7	.8	36.1	45	3.9
Peppers (green)	16 (stem ends, seeds and cores)	95	4.6	.8	21.7	42	1.5
Potatoes (Irish)	16 (parings)	318	7.6	.4	72.8	42	2.7
Rutabaga	15 (parings)	147	4.2	.4	34.4	212	1.5
Soybeans (dried)	0	1,503	158.4	82.2	158.0	1,031	36.3
Spinach (fresh)	18 (main stalk and outer leaves)	73	8.6	1.1	11.9	301	11.2
Sweet potatoes	14 (parings)	480	7.0	2.7	108.8	117	2.7
Tomatoes (fresh)	12 (skin, stem end and inedible flesh)	81	4.0	1.2	16.0	44	2.4
Turnips	13 (parings)	126	4.3	.8	28.0	158	2.0

* **Composition of Foods — Raw, Processed, Prepared,** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

citrus fruits. In general the younger, growing leaves are higher in ascorbic acid than are the more mature ones. Leafy vegetables, as a class, are not especially valuable as sources of thiamine and niacin; but as sources of riboflavin, they rank quite high and are especially valuable in areas where the variety of food is limited.

Minerals, too, are important contributions of the leafy vegetables. As a rule, leafy vegetables are valuable sources of both iron and calcium. Thin green leaves and the outer leaves of lettuce and cabbage are usually higher in calcium and iron than are bleached leaves.

The stem vegetables closely resemble the leafy vegetables in many ways. Here again the green color is indicative of the higher nutritive value. Green asparagus and green celery are higher in vitamin A value and iron than are the bleached varieties.

The use of flowers as vegetables is limited. Cauliflower and broccoli are much more extensively used than any others. Cauliflower is a good source of ascorbic acid, thiamine, and riboflavin, and broccoli of vitamin A value, ascorbic acid, phosphorus, and iron.

Courtesy of Consumer's Guide

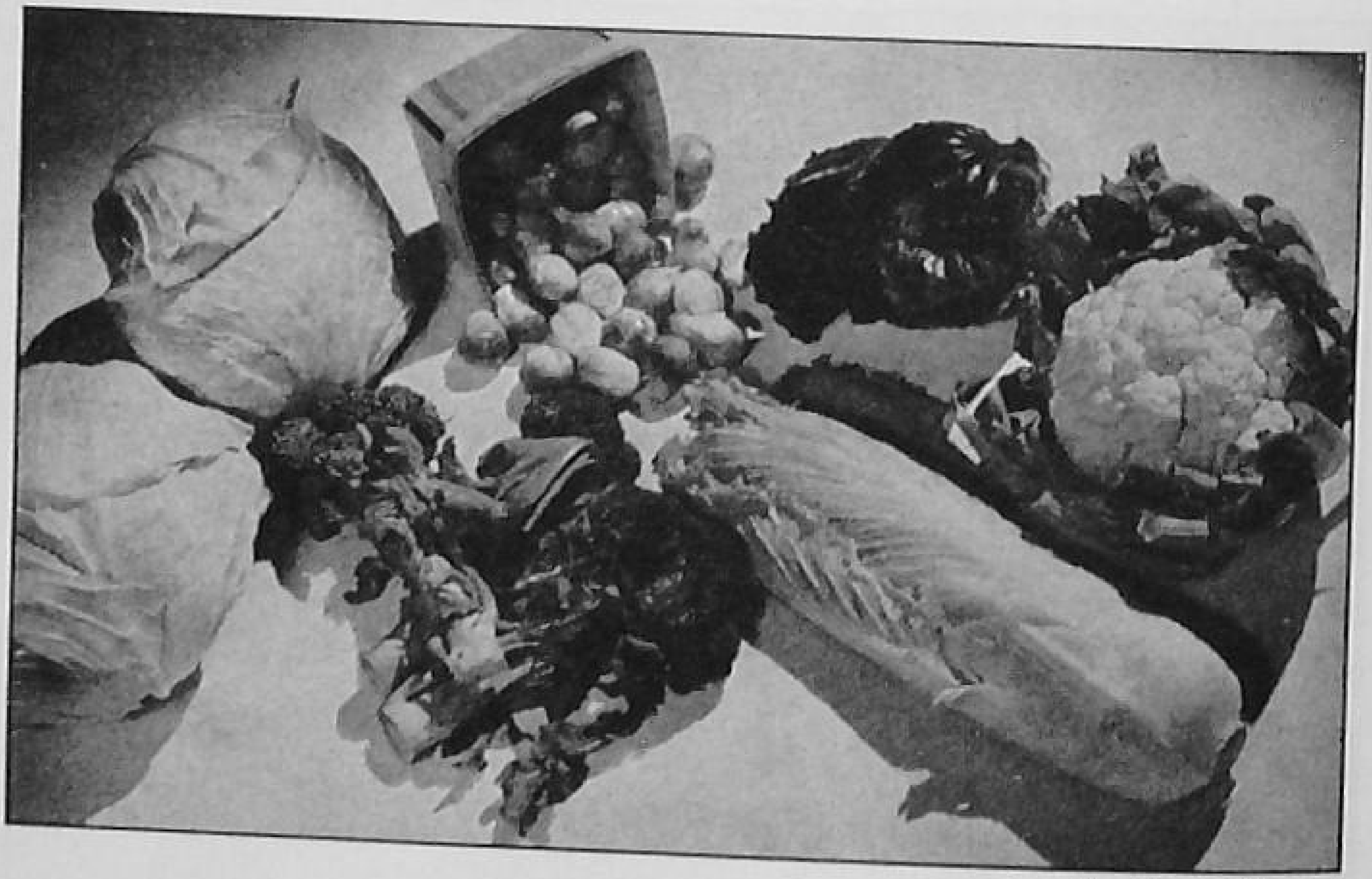
Fig. 40

The onion family, with its distinctive flavor, is valued both as a vegetable and a seasoning. Shown here are leeks, shallots, chives, and scallions.

The seed vegetables differ markedly from the other classes. Common examples of this class are corn, peas, and beans. Because of their high protein content the mature legumes are frequently used as the main protein dish of a meal. The protein of most of these vegetables is not adequate; so, it is best to supplement them with meat, milk, or eggs. Green peas are high in ascorbic acid. Peas and beans, both the green and the mature seed, are excellent sources of thiamine and good sources of niacin and riboflavin. They are also valued for their contribution of phosphorus and iron.

Among the other classes of vegetables the following are much used: carrots and sweet potatoes, of the root vegetables; onions, of the bulb vegetables; and potatoes, of the tuber vegetables. Carrots and yellow sweet potatoes, unlike most root vegetables, are rich in vitamin A. They are also good sources of ascorbic acid and thiamine, as are onions and potatoes.

Because of its wide use the potato should perhaps receive more consideration than other vegetables. In 1953 the annual per capita consumption of potatoes in the United States was 102 pounds.[1] In comparison with



Courtesy of Forecast

Fig. 41

The cabbage clan, pictured here, are related in flavor but vary in form and in the part of the plant eaten. From left to right: cabbage, broccoli, Brussels sprouts, Chinese cabbage, red cabbage, and cauliflower.

[1] *The National Food Situation*, NFS–71, Bureau of Agricultural Economics, United States Department of Agriculture, February, 1955.

that of other fresh vegetables, the caloric content of potatoes is relatively high. The potato is said to rank third as a source of energy in the world's dietaries. It contains about 75 per cent water, 20 per cent carbohydrate, 2.5 per cent protein, and about 1 per cent ash. The potato protein is of high nutritive value, and both it and the starch are well utilized by the body. Potatoes should be well cooked for their starch to be most effectively utilized by the human body. Although the percentage of iron in potatoes is low as compared with that in many vegetables, it is in such a form that it is completely utilized. This, together with the fact that relatively large amounts of potatoes are consumed, makes them an important source of iron in many diets.

As a group, vegetables are valuable for bulk, minerals, and vitamins. They are low in calories and protein. They are appetizing and generally pleasing and refreshing.

So important are fresh vegetables and fruits considered that in the master food plan at moderate cost the Bureau of Human Nutrition and Home Economics recommends for a moderately active woman 182 pounds of green, leafy and yellow vegetables, exclusive of sweet potatoes, a year, 130 pounds of citrus fruits and tomatoes and 182 pounds of other vegetables and fruits exclusive of potatoes, sweet potatoes, and dry legumes.[1]

Storage of vegetables

It is often necessary to store vegetables for a period before use. The keeping quality of the vegetable depends upon its nature. Although, with a few exceptions, vegetables are at their best immediately after they are harvested, most roots, bulbs, tubers, and seeds may be stored for varying periods of time without serious injury to quality.

From the standpoint of keeping quality, vegetables are sometimes classed as perishable, semi-perishable, and staple. The perishable ones have comparatively poor keeping quality even when stored in a refrigerator or in crushed ice, while the semi-perishable will keep for some little time. The staple may be satisfactorily kept for some time without refrigeration.

Vegetables classed as staple were once stored in an outside pit, or a storage cellar but today a basement storage room is generally more convenient. For storage, root crops such as beets, carrots, parsnips, and rutabagas should be of fair size but not too old. These keep well at a temperature just above the freezing point and keep best when the humidity is

[1] *Helping Families Plan Food Budgets*, Miscellaneous Publication No. 662, United States Department of Agriculture, 1952.

high and there is little circulation of air. To insure this condition the vegetables may be packed in boxes of sand. Cabbage, onions, squashes, and pumpkins keep best when fully mature. Cabbages keep well in an atmosphere of medium humidity with little circulation of air; on the other hand, onions, squashes, and pumpkins keep well when there is little moisture present and considerable circulation of air. Potatoes that are to be stored should be harvested after the vines have died. A storage temperature a few degrees above freezing is generally preferred and a rather high humidity. Potatoes when stored at a low temperature increase in sugar content to such an extent that the potato may taste definitely sweet. The increase in sugar content also affects the desirability of the potato for making potato chips or French-fried potatoes, for the sugar caramelizes and gives an undesirable dark color. The high sugar content of the potatoes diminishes if they are left in a warm room for a few days. Sweet potatoes are injured by low storage temperatures, even if these are well above freezing. Exposures that have apparently caused no damage may later prove injurious. The storage temperature should not fall below 50° F.[1] Parsnips become sweeter when left in a cold place. In this instance the increase in sugar is desirable, and there is a general preference for parsnips which have been exposed to the cold for a period of time.

Perishable and semi-perishable vegetables are best stored in a refrigerator. Most refrigerators today are equipped with hydrators which permit a little circulation of air but retain the moisture well. If a hydrator is not available, a bag of plastic film may be substituted. The latter may even be preferred in some instances because it is flexible and takes no more space than the vegetables themselves require. Asparagus retains its crispness if the butt ends are removed and the bunches are stood in from one-half to one inch of water. A wide mouthed quart jar is suitable for this. Even with careful storage, asparagus deteriorates after harvesting. Woodiness develops, due apparently to changes in the cell walls, though the change is retarded at refrigerator temperatures.

Another change, perhaps of even greater importance, that occurs in storage is loss of ascorbic acid potency. The loss of ascorbic acid tends to parallel the loss in quality of the vegetable. There is also a decrease in vitamin A and thiamine. The loss in vitamins is retarded at refrigerator temperatures and, at least in the case of ascorbic acid, by the presence of acid, as in tomatoes.

Vegetables such as tomatoes which are allowed to mature and ripen on

[1] W. D. Kimbrough and Marion F. Bell, *Internal Breakdown of Sweet Potatoes Due to Exposure to Cold*, Louisiana Agricultural Experiment Station Bulletin 354, 1942.

the vine out of doors, are usually thought to have the best flavor. Some persons, however, prefer tomatoes produced in greenhouses or ripened after leaving the vine, for these are firmer in texture and less juicy. The food value is not greatly impaired by picking the tomato while green. However, the ascorbic acid content may be somewhat less, which is a point to be considered, as tomatoes are often important as a source of this vitamin. Although tomatoes when fully ripe are highly perishable, they may be kept for some time when picked green. Hence there is an economic advantage involved in the harvesting of the tomato in this stage. When this is done, careful control of the storage temperature results in satisfactory ripening, or the fruit may be treated with ethylene gas to hasten the change in color or to "degreen" it. The treatment seems to have no detrimental effect upon most of the food values, but, as with all tomatoes picked green, the ascorbic acid content is less than that of the tomato allowed to ripen on the vine.

It is important that immature seed vegetables, such as green peas and sweet corn, be used soon after picking, for they deteriorate rapidly in quality. The change in flavor is due mainly to conversion of sugar to starch. This change occurs more rapidly at high temperatures. If the immature vegetables must be held for a time before using, storage at a low temperature is best.

With the successful development of freezing as a means of keeping foods, many vegetables are now so preserved. Practically all vegetables that require cooking before serving are frozen, but the most popular vegetable for freezing is green peas. Frozen vegetables should be kept frozen until ready to cook. Experimental work indicates that the nutritive value of frozen foods when ready to serve may be equal to that of the cooked fresh product.

Selection

The vegetables served are largely determined by habit and taste. If a family likes certain vegetables, it is probable that few others will be included, despite the monotony of having the same food served four or five times or even more each week. This fixity of habit in some homes prevents the introduction into the diet of new, palatable, and nourishing vegetable dishes. A wide use of seasonable vegetables in the daily diet is a commendable food practice. There is need for intelligent consideration of the contribution new vegetables may make toward meeting the daily food needs and of their usefulness in introducing variety and stimulating appetite.

Waste in vegetables

The waste in fresh vegetables is not generally realized and frequently is not considered in their purchase. The quality, size, shape, and condition of these foods have much to do with the amount of waste. Frequently, poor quality means a high percentage of waste, though this is not always the case. Table 26 shows the percentage of waste or refuse in a number of vegetables.

Color classification

For purposes related to cookery, vegetables are often classified according to color as green, red, yellow, or white.

Green. The color of the vegetable is determined by the pigment present. Green vegetables contain chlorophyll. It is well known that chlorophyll is present in all green plants and that it is essential to the manufacture of carbohydrates by the plant. Perhaps equally well known is the fact that plants are green only when grown in the presence of light. Blanched celery and white asparagus are familiar examples of vegetables grown in the absence of light. As previously mentioned, some relationship apparently exists between the green color of the vegetable and the vitamin A value.

Chlorophyll, like the other pigments, is a definite chemical compound and reacts in a certain manner. It is only very slightly soluble in water, as is shown by examination of the water in which green vegetables are cooked. Heat tends to destroy the bright green color leaving a drab bronze-green. The change is much more rapid at high temperatures, such as are obtained when the pressure cooker is used, than at boiling temperature. This is apparent whenever green vegetables are cooked for a long time. The addition of an acid also fades the color. Hence, it is sometimes hard to keep cucumber pickles bright green. An alkaline solution favors the green color, and in this medium it is retained for a much longer period of time. Baking soda or hard water is most often used to obtain this alkaline medium. However, it is well to mention in connection with this the more rapid destruction of ascorbic acid in an alkaline solution. Since the vitamin content is usually more important than the green color, the use of an alkali is to be questioned. Another objection to the use of an alkali is that the texture of the vegetable is likely to be broken down excessively and a mushy product may result. The presence of copper or zinc salts stabilizes the green color. Consequently, our great-grandmothers were usually successful in obtaining green cucumber pickles, for often the pickling kettle was made of copper. The possible harmful effect of copper in any considerable amount, as well as the difficulty of cleaning

copper utensils, has led to an almost complete abandonment of this material for cooking utensils in the home.

Red. The red vegetables contain anthocyanins, another type of plant pigment. These are also present in blue and purple fruits and vegetables. Anthocyanins are extremely soluble in water but are little affected by heat. Because of the variety of colors obtained under different conditions of acidity, anthocyanins are the most interesting of the pigments. Thus they are often red in an acid and blue in a slightly alkaline medium. Red cabbage, a good example of color change, may go from red through various shades of blue to green, depending upon the acidity. Fruits which owe their coloring to anthocyanins behave similarly. These substances react with a number of metals, and a modified color frequently results. Tin salts usually give purple, whereas iron salts often give blue. There are comparatively few red vegetables but quite a number of red fruits which are ordinarily cooked. Beets lose their bright red color and may be dull or faded, although they do not change to blue under ordinary cooking conditions. If vinegar is added, they usually become a brilliant red after a short time. Blue Italian plums when cooked are a reddish-purple. Black raspberry jam tends to become brighter in hue when an acid, such as lemon juice, is added.

Yellow. The yellow color associated with chlorophyll whenever it occurs, and also found in carrots, squash, and similar vegetables, is very stable. This color is due to a class of pigments known as carotinoids, of which carotene found in carrots, zanthophyll present in yellow corn, and lycopene in tomatoes are typical examples. Under ordinary conditions of cooking these pigments remain unchanged. They are not destroyed by the usual temperatures of cooking, are almost insoluble in water, and are not appreciably affected by acids or alkalies. The slightly brown tinge sometimes obtained when carrots are cooked for a long time is probably due to caramelization of the sugar. A close relationship exists between carotene and vitamin A, as shown by the fact that the animal body can convert carotene into vitamin A.

White. Although white vegetables are not usually considered as containing pigments, certain white or cream-colored vegetables do contain flavones, compounds which are colorless when slightly acid but yellow when alkaline. This change may be observed in the preparation of yellow-skinned onions. Practically all vegetables contain some flavones, but these are usually not noticed if other pigments are present. The yellow color of the water in which certain vegetables have been cooked is often due to flavones, for they are rather soluble. The color changes are rever-

sible; that is, if the vegetable containing flavones has turned yellow due to the alkaline reaction of the cooking water it may be made white again by the addition of a small amount of acid. The presence of iron or iron salts may turn the flavones an unpleasant green or brown. This may result when the vegetables containing flavones are cooked in a chipped enamel pan or in water containing iron salts.

Strong- and mild-flavored classification

The classification of vegetables as strong- or mild-flavored is based upon the presence or absence of certain sulfur compounds. Such a compound is not undesirable in uncooked or slightly cooked vegetables. In fact, it is partially responsible for the characteristic taste of the so-called strong-flavored vegetables such as cabbage, turnips, and cauliflower. The objectionable flavor of old or stored vegetables, such as turnips or cabbages, may be due to the decomposition of some of the sulfur compounds by enzymes. The sulfur compounds tend to break up when the vegetables are cooked, forming hydrogen sulfide with its well-known odor and flavor. Other compounds are formed which also affect the flavor but perhaps to a lesser degree. Fortunately, the decomposing of the sulfur compounds occurs slowly at the beginning of the cooking process. Only when the vegetables are cooked under unfavorable conditions, or for too long a time, do unpleasant flavors and odors develop. This is hastened by the presence of acid and by high temperatures.

PROBLEM 5 *How shall vegetables be prepared?*

Preparing raw vegetables

Many vegetables which are low in starch are attractive in appearance and are good to eat raw when they are crisp and tender. Raw vegetables generally offer the same problem of preliminary preparation as do raw fruits but require more cleaning. Vegetables commonly grow in or close to the ground, and so are exposed to contamination even more than are fruits. All soils contain organisms, many of them pathogenic. Even if the vegetables escape contamination by the soil, they are exposed to dust, insects, and human hands before being brought into the home. Hence

careful and thorough washing is essential. All spoiled portions should be removed. Whether the vegetable shall be washed only, washed and brushed, scraped, or peeled, is determined by the vegetable selected, its age, and the method of preparation. Lettuce or celery offers no problem, but there is a question whether young carrots shall be merely thoroughly washed or scraped also. Scraping requires more time and results in greater loss of food value. Tomatoes may be dipped for a few seconds in boiling water or rotated over a hot flame until the skin breaks, after which they peel readily. With the exception of tomatoes, crispness is desirable in vegetables served raw. The clean raw vegetables may be placed in a hydrator and returned to the refrigerator until time to serve, or they may be allowed to stand in cold or ice water for a short time. It is well to keep in mind, however, that the soaking of vegetables, especially when they are cut in small pieces, may result in significant losses of nutritive value. To an increasing extent, vegetables are being used raw, with only the preliminary treatment given above. However, custom, preference, and the character of certain vegetables make it desirable that in their preparation this cleansing process be followed by an additional one of cookery.

Preparing cooked vegetables

Certain vegetables which are cooked have thick skins, so require paring before cooking. Among these are turnips, rutabaga, and eggplant. Beets are usually peeled after cooking. Potatoes, if new, may be scraped, or if more mature, may be peeled, either before or after cooking. Peeling after cooking results in less loss of nutrients, for paring before cooking removes a large portion of the cortex of the potato, the portion richest in minerals and starch.

Cooked vegetables can be well prepared in a variety of ways, even though general practice would seem to indicate otherwise. The preparation of potatoes, for example, often has but little variation within a family's culinary practice, despite the fact that one well-known recipe book lists 119 different methods of serving potatoes and another describes 60. This is almost equally true of other vegetables. They may be boiled, steamed, or baked. They may be steamed over boiling water or under pressure. Pressure saucepans which are easily handled and quickly cooled offer possibilities for the quick cooking of vegetables at temperatures above that of boiling water. Vegetables may be cooked alone or in combination. They may be boiled in water or in meat stock or cooked in milk. They may have meat, cheese, or eggs added for flavoring and increased food value. If boiled or steamed, they may be mashed or creamed; they may

be seasoned with butter or with a nourishing sauce; they may be dipped in batter and fried; or they may be browned in butter. They may be served with a tart vinegar or lemon sauce, or coated with sugar and butter and glazed.

Frozen vegetables are usually boiled or steamed. If boiled, only a small amount of water is necessary. The vegetable while still hard-frozen is added to boiling salted water. Exceptions are corn on the cob and greens such as spinach, both of which should be at least partially defrosted before cooking. The cooking time after the boiling temperature is reached is about one half that required for fresh vegetables.

Effect of cooking

Before specific directions for cooking vegetables are given, it is well to consider the general effect of cooking upon the product. The texture of the vegetable is modified, for cooking softens the cellulose, it may change the hemicellulose to soluble form, and it tends to separate the individual cells, rendering other constituents more available. Cooking does not — at least not in all vegetables — rupture the cell walls, as is frequently stated. However, the starch granules swell and are more palatable after cooking. Some starch may be changed to soluble form and some may be hydrolyzed. Some of the proteins may be coagulated and some dissolved. If the vegetable is cooked in water, part of the sugar and part of the minerals are extracted and frequently from 30 to 50 per cent of the water-soluble vitamins may be found in the cooking water. This may be a serious loss, since the cooking water is so seldom used.

The probable destruction of the vitamins is also important. Vitamin A is little affected by heat, and destruction of thiamine may be insignificant with ordinary cooking methods. Ascorbic acid is the most affected, being in some cases almost entirely lost. In tomatoes, an acid food, this vitamin is little affected by cooking; but it was found in one study that cabbage cooked in an open kettle retained only 33 per cent of its ascorbic acid; and spinach retained only 39 per cent.[1]

Many vegetables may lose part of their water content during cooking. This is especially true of the leafy vegetables. There appears also to be a reduction in bulk, but this is probably largely due to change in form.

Cooking destroys any active microorganisms present and may completely sterilize vegetables which require longer cooking. This is one reason for feeding only cooked vegetables to infants and small children. Cooking modifies the flavor and often alters the color and appearance of

[1] Halliday and Noble, *Hows and Whys of Cooking*, University of Chicago Press, 1946.

vegetables, and renders other constituents more quickly digestible, probably because of the partial disintegration of the cellulose.

Preserving the color and flavor of vegetables

As previously stated, vegetables may be classified as green, red, yellow, or white. They also may be grouped by flavor as strong or mild. Because it is desirable that cooked vegetables retain their natural color and a pleasing flavor, vegetables should be cooked so that these are injured as little as possible.

Vegetables are slightly acid in reaction. As the vegetable is cooked the acid is liberated from the cells in which it is enclosed within the plant. Unless it is allowed to escape from the kettle, it comes in contact with the other parts of the vegetable, with varying results. As to the colors, one notes that acid destroys the bright green of chlorophyll, brightens the red of anthocyanins, does not affect the yellow or orange of carotinoids, and preserves the white in flavones. One may also note that the sulfur compounds present in strong-flavored vegetables are less stable in the presence of acid, hence undesirable flavors develop more readily in an acid medium. Fortunately much of the acid of vegetables is volatile; that is, it tends to escape with the steam and probably some of the strong flavor with it if the utensil is uncovered. Vegetables of this type may be cooked satisfactorily in the pressure saucepan if the cooking time is kept to a minimum. The pressure saucepan also may be used to advantage for cooking certain green vegetables. In this utensil the temperature reached is sufficiently high to shorten the cooking time, with the result that the color is well retained. Peas cooked in the pressure saucepan may retain their color even better than those cooked in an open kettle. It is important, however, not to cook at one time more than the recommended amount of vegetable for a given size saucepan and to observe with care the cookery time recommended.[1]

In general, if a neutral or slightly alkaline medium is desired the vegetable should be cooked in an uncovered utensil. Since the volatile acids are given off during the first few minutes of cooking, a desirable practice is to leave the utensil uncovered during the first part of the cooking period. The container may then be covered to finish cooking. A shortened cooking time is required and some loss of ascorbic acid due to oxidation is prevented. This applies to all strong-flavored vegetables such as cauliflower and onions, and all green vegetables, excepting possibly spinach and other tender greens. These latter are cooked for such a short time and are so high in chlorophyll content that the green color is not markedly affected by

[1] Halliday and Noble, *Hows and Whys of Cooking*, University of Chicago Press, 1946.

Table 27. EFFECTS OF VARIOUS FACTORS UPON THE PIGMENTS OF FOODS

Pigment	Color	Water	Acids	Alkalies	Heat	Metals
Chlorophyll	Green	Very slightly soluble	Turn it a bronze green	Brighten and intensify it	Turns it a bronze green	Copper and zinc brighten and intensify it
Carotinoids Carotene Lycopene Xanthophyll	 Yellow Red Yellow	Insoluble	Stable	Stable	Stable	Stable
Anthocyanins	Red to blue	Soluble	Brighten or turn them red	Dull or turn them blue	Stable	Tin and iron turn them to purple, blue, or green
Flavones	White	Soluble	Turn them white	Turn them yellow	Stable	Iron turns them green or brown

cooking in a covered utensil for the entire period. However, from the standpoint of flavor, some persons prefer to have certain so-called mild-flavored vegetables, such as carrots, cooked uncovered. Through experiment, individual preference may be determined.

If red vegetables, such as beets, are being cooked, the general practice is to cook before peeling, as the anthocyanins are exceedingly soluble. If beets are peeled before cooking, care must be taken to evaporate all of the cooking water, so that the color will be cooked back into the vegetable. Though the flavor of beets is little affected by the method of cooking, the color is best retained in an acid medium; hence beets should be cooked in a covered utensil to retain the volatile acids.

Yellow vegetables and the white vegetables containing flavones retain their color well and so, unless strong-flavored, are cooked in a covered utensil.

The quantity of water used for cooking vegetables, especially strong-flavored ones, has received considerable attention. It is a generally accepted fact that a large quantity of water results in greater loss of food value. Some believe that the increased loss of food value is more than balanced by an improved flavor, although others prefer the same vegetable when cooked in a small amount of water.

Degree of cooking

Another factor which should be considered is the degree of cooking. Overcooking is responsible for more undesirable flavors and faded unattractive colors in vegetables than is any other one thing. There are fewer overcooked vegetables than there were a few years ago. It is reasonable to assume that this is, at least in part, responsible for the increased consumption of vegetables. Even so, it seems that much emphasis should be placed upon the standards of "doneness" for vegetables. Many vegetables, such as cauliflower, carrots and cabbage would be received with greater favor if they were removed from the heat while still slightly crisp rather than being cooked until tender all the way through. Such preparation would aid in better retention of shape, more desirable texture, and higher food value. Important factors affecting the form and texture of cooked vegetables are the variety and type used. Boiled potatoes, cooked under the same conditions, may be firm, tender, and attractive or mushy, soggy, and repelling, depending upon the variety of potato. Other vegetables may show similar variation. Although the flavor and food value of a vegetable may not be greatly affected, the acceptability of the vegetable may be modified and thus the amount which is consumed may be reduced.

Form and texture

The form and texture of a vegetable is affected by the method and length of cooking time. Vegetables boiled rapidly break up, due to mechanical agitation, and cook no more quickly than those boiled slowly.

Other factors such as the use of hard water, the use of soda, and the time of adding the salt, when vegetables are cooked in water, exert an influence. The effect of hard water upon dried legumes was known long before experimental work was done on foods. The presence of either calcium or magnesium salts in the water hardens beans in proportion to the salts present. Baking soda added to the water in which beans are soaked or cooked makes them become tender sooner. It has been reported that the addition of salt at the beginning or at the midpoint of the cooking period improves the texture as well as the flavor of a vegetable. Spinach, cabbage, turnips, beets, carrots, dried navy beans, green peas, white potatoes, and green string beans were used in this study, and the results were similar for all of them.

Loss of food value

Loss of nutrients during cookery should be avoided. Such loss is due mainly to the dissolving out or destruction of sugar, minerals, and vitamins. Some nitrogenous substances, often protein, and some starch are lost. The loss of nutrients is affected by a number of factors, among which are the nature of the vegetable, the treatment before cooking, the size of the pieces, the method, length, and temperature of cooking, the quantity of cooking water, whether started in hot or cold water, the reaction of the water, and possibly the time of adding the salt. Increased food losses may be noted when vegetables are peeled, when they are allowed to stand in water before cooking, and when they are cut into small or even medium-sized pieces for cooking. When vegetables are prepared with much cut surface exposed to the action of water, particularly if the surface is cut across the fibers, the losses of soluble nutrients have been assumed to be large. This is not always true for ascorbic acid, as was shown by a study in which the losses were approximately the same in rutabagas cut into ½ inch cubes and ½ inch lengthwise slices; in cabbage cut into ¼ inch strips and 1½ inch wedges; and in green beans cut into one-inch lengths and left whole. However, green beans when "Frenched" showed almost twice as great a loss as when cut into one-inch pieces or left whole.[1] Studies of methods of cooking show progressively greater nutritive losses when vegetables are steamed, cooked in a small amount of water, and

[1] Halliday and Noble, *Hows and Whys of Cooking*, University of Chicago Press, 1946.

Table 28. CHARACTERISTICS AND PREPARATION OF FRESH VEGETABLES *

Vegetable	Predominating Pigment	Strong or Mild Flavor	Amount to Purchase for 4 Servings	Description	Covered or Uncovered for Boiling	Time for Cooking (Minutes): Boiling	Steaming	Baking	Pressure saucepan †
Artichokes, French	Chlorophyll	Mild	2 lb	Whole	Uncovered	35–45	. . .	. . .	10–12
Artichokes, Jerusalem	Chlorophyll	Mild	1 lb	Pared, whole	Covered	25–35	35	30–60	. . .
Asparagus	Chlorophyll	Mild	1½–2 bunches or 1 lb	Tips	Uncovered	5–15	7–15	. . .	½–1½ †
	Chlorophyll	Mild		Butts	Uncovered	15–25	12–30	. . .	1–2 †
Beans, Fresh Lima	Chlorophyll	Mild	4/5 lb shelled 1½ to 2½ lb in pods	Shelled	Covered	20–40	25–40	. . .	1–3
Beans, Green	Chlorophyll	Mild	4/5 lb	Whole or 1-inch pieces	Uncovered	20–35	15–30	. . .	1½–3 †
Beets, Young, small	Anthocyanins	Mild	1–1½ bunches	Whole	Covered	30–45	40–60	40–60	5–10
Beets Mature, small	Anthocyanins	Mild	1–1¼ lb	Whole	Covered	45–90	50–90	50–90	10–18
Beet Greens	Chlorophyll	Mild	1–1½ lb		Uncovered	5–15	. . .	. . .	. . .
Broccoli	Chlorophyll	Strong	1½–2 lb	In flowerlets	Uncovered	8–20	15–20	. . .	1½–2½ †
Brussels Sprouts	Chlorophyll	Strong	4/5–1 lb	Whole with cross in top	Uncovered	6–15	8–18	. . .	1 †

* The amount to purchase and the length of time suggested for cooking are approximations only.

† The cooking time suggested in this column is for the light-weight cookers, which can be quickly cooled by being set in cold water. For vegetables marked (†) set the cooker in cold water to reduce the pressure quickly.

Table 28. CHARACTERISTICS AND PREPARATION OF FRESH VEGETABLES * (continued)

Vegetable	Predominating Pigment	Strong or Mild Flavor	Amount to Purchase for 4 Servings	Description	Covered or Uncovered for Boiling	Time for Cooking (Minutes)			
						Boiling	Steaming	Baking	Pressure saucepan †
Cabbage, White	Flavones	Strong	1 lb	Quartered	Uncovered	12–15	15	. . .	2–3 †
White	Flavones	Strong	1 lb	Shredded	Uncovered	5–9	10–11	. . .	1 †
Green	Chlorophyll	Strong	1 lb	Shredded	Uncovered	3–8	8–10	. . .	½–1½ †
Carrots, Young	Carotene	Mild	1–1½ bunches	Whole or halves	Covered	15–25	20–30	35–45	3–5
Old	Carotene	Mild	¾–1 lb	Diced	Covered	15–20	20–25	. . .	2–3
Cauliflower	Flavones	Strong	1¾–2 lb	Whole	Uncovered	20–30	25–30	. . .	3½ †
	Flavones	Strong	1¾–2 lb	Flowerlets	Uncovered	8–15	10–15	. . .	1½ †
Celeriac	. . . .	. . . .	1¾–2 lb	Sliced or diced	. . . .	15–20	25	. . .	. . .
Celery	Chlorophyll	Mild	1 bunch	Diced	Covered	15–20	25–30	. . .	2
Chinese Cabbage	Chlorophyll	Strong	¾–1 lb	Sliced	Uncovered	8–10	. . .	. . .	. . .
Collards	Chlorophyll	Strong	2 lb	. . . .	Uncovered	10–20	. . .	. . .	. . .
Corn	. . . .	Mild	4 ears	On cob	Covered	5–10	10–15	. . .	0–1½ †
Cucumbers	Chlorophyll	Mild	3 medium	Sliced	Covered	5–6	. . .	. . .	. . .
	Chlorophyll	Mild	2 medium	Whole, stuffed	Covered	. . . .	20	20–25	. . .

* The amount to purchase and the length of time suggested for cooking are approximations only.

† The cooking time suggested in this column is for the light-weight cookers, which can be quickly cooled by being set in cold water. For vegetables marked (†) set the cooker in cold water to reduce the pressure quickly.

Table 28. CHARACTERISTICS AND PREPARATION OF FRESH VEGETABLES* (continued)

Vegetable	Predominating Pigment	Strong or Mild Flavor	Amount to Purchase for 4 Servings	Description	Covered or Uncovered for Boiling	Time for Cooking (Minutes)			
						Boiling	Steaming	Baking	Pressure saucepan †
Dandelion Greens	Chlorophyll	Mild	1¾ lb	....	Uncovered	15–25	...	...	...
Egg Plant	Chlorophyll	Mild	1 medium	Diced	Covered	8–15	12–20	...	...
	Chlorophyll	Mild	2 small	Whole, stuffed	....	...	...	30–45	...
Kohlrabi	Flavones	Strong	1 lb	Pared, sliced	Uncovered	20–30	30	...	...
Mustard Greens	Chlorophyll	Strong	1½–2 lb	....	Uncovered	15–25	...	...	...
Okra	Chlorophyll	Strong	1 lb	Whole	Uncovered	10–20	20	...	3 †
Onions	Flavones	Strong	1 lb	Large, whole or partially quartered	Uncovered	20–35	...	45–60	5–8 †
	Flavones	Strong	1 lb	Small, whole	Uncovered	15–25	...	30–50	3–4 †
Parsnips	Flavones	Mild	1 lb	Sliced	Covered	15–25	30–40	...	6
Peas, Green	Chlorophyll	Mild	1½–2 lb in pod	Shelled	Uncovered	8–20	10–20	...	0–1 †
Peppers	Chlorophyll	Strong	4	Whole, stuffed	Uncovered	10–15	...	25–30	...
Potatoes, White	....	Mild	1–1½ lb	Whole, small	Covered	25–35	30–45	45–60	8–10

* The amount to purchase and the length of time suggested for cooking are approximations only.

† The cooking time suggested in this column is for the light-weight cookers, which can be quickly cooled by being set in cold water. For vegetables marked (†) set the cooker in cold water to reduce the pressure quickly.

Table 28. CHARACTERISTICS AND PREPARATION OF FRESH VEGETABLES * (continued)

Vegetable	Predominating Pigment	Strong or Mild Flavor	Amount to Purchase for 4 Servings	Description	Covered or Uncovered for Boiling	Time for Cooking (Minutes): Boiling	Steaming	Baking	Pressure saucepan †
Potatoes, Sweet	Carotene	Mild	1–1½ lb	Quartered lengthwise	Covered	15–25	25–30	. . .	6–8
		Mild	1–1½ lb	Whole	. . . .	25–35	30–35	30–50	8–10
Pumpkin	Carotene	Mild	1½–2 lb	Diced	Covered	20–25	25–30	. . .	8–10
Rutabaga	Carotinoids	Strong	1¼ lb	Diced	Uncovered	20–30	. . .	. . .	5–8 †
Salsify	. . . .	Mild	1 lb	Sliced	Covered	15–20	20	. . .	. . .
Spinach	Chlorophyll	Mild	1½–2 lb	Without stems	Covered or Uncovered	3–5	5–10	. . .	0–1½ †
	Chlorophyll	Mild	1–1½ lb	With stems	Covered or Uncovered	5–10	6–12	. . .	0–1½ †
Squash, Summer	Chlorophyll	Mild	1½–2 lb	Sliced	Covered	5–15	15–20	30	1½–3
Squash, Winter	Carotene	Mild	1½–2 lb	Diced	Covered	25–30	30–40	. . .	6–12
	Carotene	Mild	1½–2 lb	1-portion pieces		. . .	. . .	50–70	. . .
Tomatoes	Lycopene	Mild	1 lb	Whole	Covered	5–10	10	15–25	. . .
		Mild	1 lb	Whole, stuffed		. . .	15–20	20–30	. . .
Turnips	. . . .	Strong	1 lb	Diced	Uncovered	10–20	20–25	. . .	1½–3 †
Turnip Greens	Chlorophyll	Strong	1½-2 lb	. . . .	Uncovered	15–25	. . .	. . .	1–1½ †

* The amount to purchase and the length of time suggested for cooking are approximations only.

† The cooking time suggested in this column is for the light-weight cookers, which can be quickly cooled by being set in cold water. For vegetables marked (†) set the cooker in cold water to reduce the pressure quickly.

cooked in a large amount of water. Steaming and baking show similar losses. In baking there may be greater loss of ascorbic acid and less loss of other vitamins and minerals than in steaming. Recent studies on potatoes have shown that the retention of ascorbic acid was 88 per cent when first baked, but only 74 per cent after standing eleven minutes, and 61 per cent after twenty-six minutes.[1] Baking and steaming are recommended for frequent use for all vegetables for which they are suited.

Vegetables cooked in a small amount of water show little loss if the water is evaporated at the end of the cooking period. Those cooked in a large amount of water may show as high as 60 per cent loss of protein and iron. The exact loss varies with different vegetables and for different nutrients. Leafy vegetables show greater cooking losses than compactly formed root vegetables. Higher cooking temperatures may result in greater destruction of vitamins, but if the cooking period is shortened accordingly, this may not be true. The temperature probably has little effect on the other nutrients. The length of the cooking period principally affects the vitamins, as already noted; but if the vegetables are overcooked, more of the soluble substances will be found in the cooking water. The time necessary for cooking is decreased materially by starting the vegetable in boiling rather than cold water. This also results in less vitamin loss. Pressure saucepan cooking gives good results in conserving soluble food nutrients. Considerable disagreement exists concerning the effect of salt on losses in food value. Some workers have found the loss of iron greater in vegetables cooked in salted water than in unsalted. Others have shown a greater retention of ascorbic acid when the vegetables are cooked in salted water.

Service

The right degree of seasoning is essential if the vegetable is to be most appetizing. The purpose of seasoning is to render the vegetable more agreeable, or more palatable, and to bring out or accentuate the natural flavor. Therefore the seasoning should be used sparingly and with great care. If the vegetables are to be buttered they should be well drained. If desired, bacon fat, salad oil, or other fats may be used.

Frequent admonitions are given to save the liquid and serve it as a vegetable bouillon. It may be combined in the *pot au feu*, a cross between a soup and a stew containing some vegetables. This dish has long had a

[1] R. Kahn and E. G. Halliday, *Ascorbic Acid Content of White Potatoes as Affected by Cooking and Standing on Steam Table*, Journal of American Dietetic Association XX, 1944; F. O. Van Duyne, J. T. Chase and J. I. Simpson, *Effect of Various Home Practices on Ascorbic Acid Content of Potatoes*, Food Research X, 1945.

wide popularity in France. Or it may be used in borsch, a Russian favorite, which offers the contrast of sour cream with beets and contains various other vegetables as well. These are representative of the soups from the old world which are meant to be eaten, rather than drunk, and which might well have a larger place in American dietaries.

When the vegetables are creamed, the purpose of the sauce is to enhance the vegetable, not to smother it. An excess of sauce should not be used. This applies also to Hollandaise and other sauces served with vegetables. Well-seasoned vegetables, attractively served at the proper temperature, add appeal and satisfaction to the meal.

Raw vegetables when served should be crisp, bright in color, and free from bruised and decayed spots. Cooked vegetables should be crisp rather than mushy. The original shape should be maintained. The flavor and color should be as natural as possible. Occasionally for some reason a vegetable cannot be served until a half hour or more after it is cooked. In that case it is better to cool the vegetable and then just before serving to heat it quickly. This method produces fewer of the characteristics of an overcooked product than does that of keeping it hot for so long a time.

ACTIVITIES

1. Prepare and evaluate leafy vegetables, selecting from among the following:

		Serve:
Beet greens Brussels sprouts Cabbage Chard or kale Collards Dandelion greens Mustard greens Spinach	Boil in small amount of water	Buttered alone or with ham, bacon, tongue, hard-cooked egg, poached egg. Puréed and mixed with thin white sauce. Au gratin, scalloped, with Hollandaise sauce or white sauce, as soufflé or timbales. Cold, molded with hard-cooked eggs, minced ham, or tongue.

2. Prepare and evaluate stalk, flower, young bud and pod vegetables, selecting from among the following:

		Serve:
Artichokes Asparagus Broccoli Cauliflower Celery Green beans Green onions Okra	Boil in medium to small amount of water	Creamed, buttered, au gratin, scalloped alone or with cheese, with Hollandaise sauce, drawn butter, mousseline sauce, or tomato sauce. Puréed and combined with thin white sauce, especially celery, asparagus, and green beans. French fried, especially cauliflower. As soufflé, especially asparagus.

3. Prepare and evaluate fruit vegetables, selecting from among the following:

Vegetables	Method	Serve:
Cucumber Eggplant Squash, summer, winter Tomato	Boil or steam	Buttered, creamed, with or without grated cheese, especially cucumber and eggplant. Diced or mashed squash.

Bake either stuffed or in halves, seasoned with butter.

Egg and crumb, then fry, especially tomatoes, eggplant, and cucumbers.

Broil tomatoes.

4. Prepare and evaluate root and bulb vegetables, selecting from among the following:

Vegetables	Method	Serve:
Beets Carrots Celeriac Kohlrabi Onions Parsnips Rutabaga Salsify Turnips	Boil or steam	Buttered, creamed, except beets. Beets with vinegar sauce. Carrots as cream soup, glazed, creamed with new peas or small onions. Turnips, rutabaga, kohlrabi, mashed. Parsnips, fried or seasoned with fresh pork. Salsify as cream soup. Onions, glazed, in soufflé, or stuffed and baked. French fried onions.

Vegetable	Method	Serve:
Sweet Potatoes	Boil Steam	Glazed or candied. Mashed or sliced and browned in butter
	Bake	Stuffed Stuffed with pineapple added Scalloped with apples

5. Prepare and evaluate potatoes, selecting from among the following:

Vegetable	Method	Serve:
White Potatoes	Boil	Buttered or mashed New potatoes with cream New potatoes with parsley butter With jackets on As hot potato salad
	Bake	In skins Stuffed Roasted with meat Rissole potatoes with egg Scalloped

- White Potatoes
  - Fry
    - French fried
    - Potato chips
    - Sautéed
    - Lyonnaise (sautéed with onion)
  - Warm up
    - Creamed
    - Scalloped or in casserole dishes
    - Au gratin with cheese
    - Mashed
      - Potato cakes, croquettes
      - Pancakes or fritters
      - Nests for creamed vegetables, fish, or meats
      - Topping for meat pies
      - Duchess

6. Prepare and evaluate seed vegetables, selecting from among the following:

- Green corn, Green peas
  - Steam or boil
    - Serve:
      - Buttered
      - With cream
      - In casserole dishes alone or in combination with other vegetables
      - Corn with beans as succotash
      - Corn in fritters, chowder, pudding or soufflé, soup

- Fresh beans, Lima beans, Butter beans, Soy beans
  - Boil
    - Serve:
      - Buttered or with cream

- Dried beans (Lima, Navy, Kidney), Dried peas
  - Boil, Bake
    - Serve:
      - Buttered
      - Seasoned with bacon, salt pork, or ham hock

Refer to *Practical Cookery*, "Vegetables," pp. 77–91; Heseltine and Dow, *The Basic Cook Book*, "Vegetables," pp. 370–412.

Recipes not included in these references are to be supplied by the instructor.

PROBLEM 6 *How shall salads be prepared?*

In many homes the plans for the meals of the day are not considered complete unless at least one salad is included. Whether the salad accompanies a meal of hearty foods or forms the main dish of a luncheon or supper, it may supply vivid color, delicious flavor, and, best of all, valuable minerals and vitamins. Throughout the year a variety of salad foods are available. In fact, hardly a natural food can be thought of that does not have some place in salad-making.

The attractiveness of a salad is largely determined by the size and shape of the pieces of food used, the color combinations, and the size and shape of the servings. Most salads are more acceptable when served thoroughly chilled. Garnishes aid materially in the attractiveness of the serving. Simple salads are most pleasing, and one food or a combination of only two or three is usually preferable to a mixture of a great variety. Combinations should be suitable. Just the right amount of a well-seasoned salad dressing adds to the palatability of the dish.

Preparation

Salad greens form the basis of, or are used as a garnish for, practically all salads. Although there has been a tendency toward a leveling off or even a decrease in the per capita consumption as well as the car-lot shipment of vegetables as a whole this does not seem to be true of lettuce, one of the important salad greens. In 1943 an estimated 58,109 car-lots were shipped in this country and in 1952, 78,251.[1] In the New York market potatoes were the only vegetable which exceeded lettuce in quantity handled. Tomatoes were the only other vegetable which closely approached lettuce in volume.[2] Head lettuce is the favorite from coast to coast, but other types come in for some consideration. New York, iceberg, and butterhead lettuce are the important varieties of head lettuce on the market. Cos or romaine is also a heading lettuce, but the elongated head formed by narrow leaves differs considerably from the other type of head lettuce. Bibb lettuce forms only loose heads. It is prized for its mild, tender leaves. Leaf lettuce is suited to production in greenhouses during the winter

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.
[2] *Produce Supply Guide, 1950*, United Fresh Fruit and Vegetable Association.

months and is widely grown both indoors and out. In spite of this, it does not compete successfully with head lettuce in volume of production.

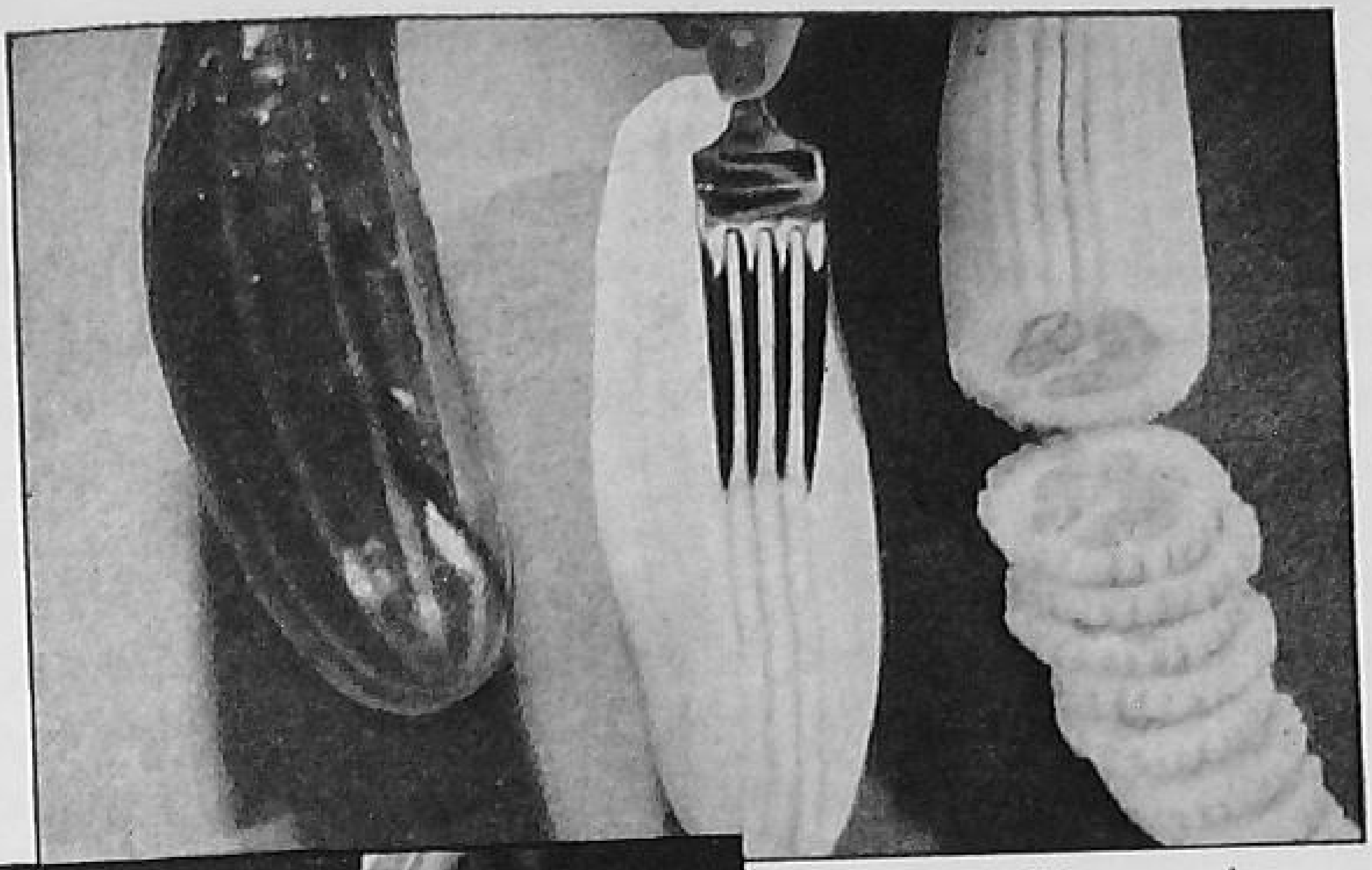
In addition to lettuce, salad greens which offer variety are the blanched heads of Witloof chicory or Belgian or French endive, curly endive, Batavian endive or escarole, and water cress. As with other green vegetables, the bright green color indicates a high vitamin content.

In selecting greens for salads it is important that fresh, crisp, tender leaves be obtained. Lettuce with a well-developed seed stalk is sure to be bitter. At the time of serving, the greens should be clean, cold, crisp, and dry. Their cleaning offers a problem because they usually grow close to the ground and collect more or less dirt and are at no time subjected to heat that might sterilize them. They should be washed in a large quantity of cold water, and the leaves should be removed from the water rather than the water poured from the leaves. When thoroughly clean, the coarse outside leaves should be separated from the inner leaves, and the former either shredded for use in the salad or put aside for use in soups or stews. The washed inner leaves may then be drained, wrapped in a damp cloth, or placed in a covered container and set in a cold place for a few hours or until ready to use. The head of lettuce may be opened by removing the core and allowing water to run through the head. The water forces the leaves apart without injuring them. If wilted, the greens may be placed in cold water for an hour or so. The addition of a tablespoon of vinegar or lemon juice to the water may hasten the freshening process.

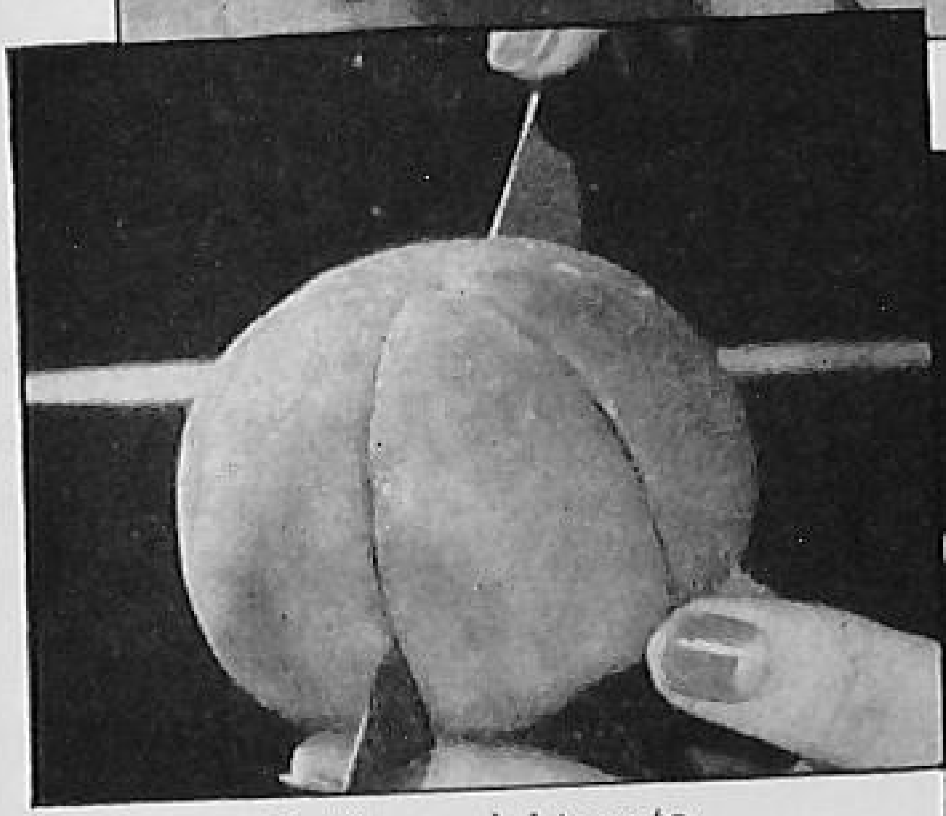
Cabbage is a favorite salad vegetable whether used alone as slaw or combined with other vegetables or with fruits. Celery, tomatoes, carrots, radishes, green peppers and cucumbers are other popular salad vegetables but the list is by no means limited to these. Practically all fruits eaten raw, including melons, likewise find use in salads. Cooked vegetables, fruits, meats, fish, poultry, eggs, nuts and even macaroni and kidney beans may be found in salad combinations.

Uncooked vegetables and meats to be combined in a salad are best cut in pieces which are small enough to be eaten easily and yet not so small that the identity of the food is lost. Fruits and vegetables that are easily cut may be left in larger pieces if desired. Cooked foods should be tender but firm enough to hold their shape. Cooked meats, fish, and vegetables are usually improved by allowing them to stand in French dressing. Fruits such as bananas and apples which ordinarily turn dark on standing may be kept satisfactorily if coated with lemon or other acid fruit juice or with a solution containing ascorbic acid.

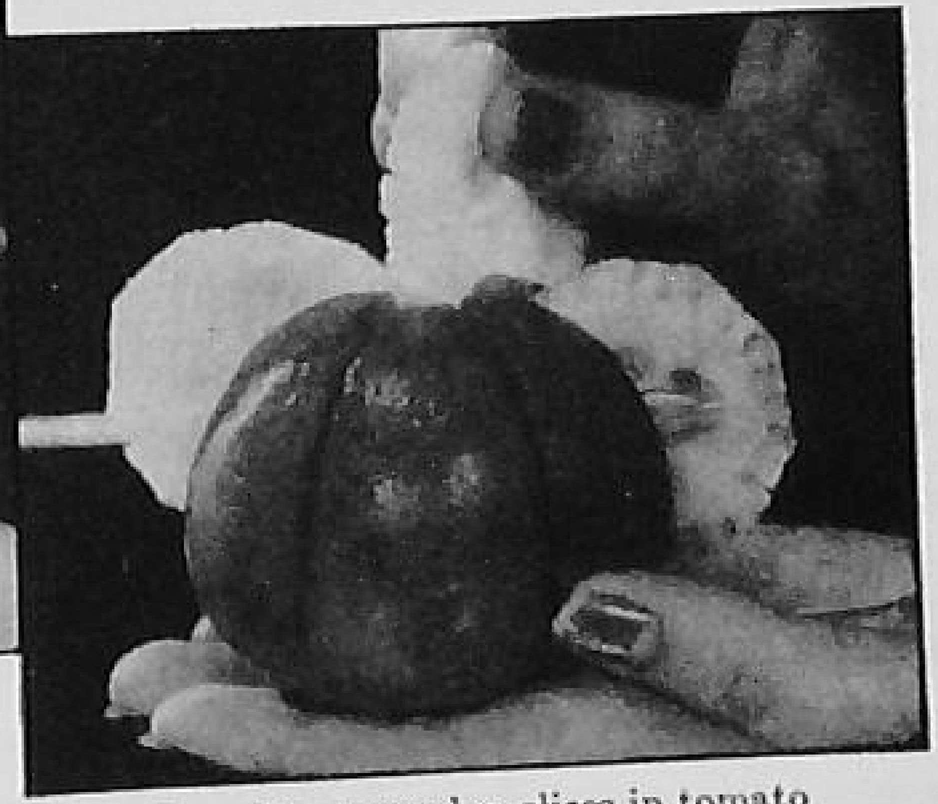
With few exceptions, salads should be mixed just before serving. The



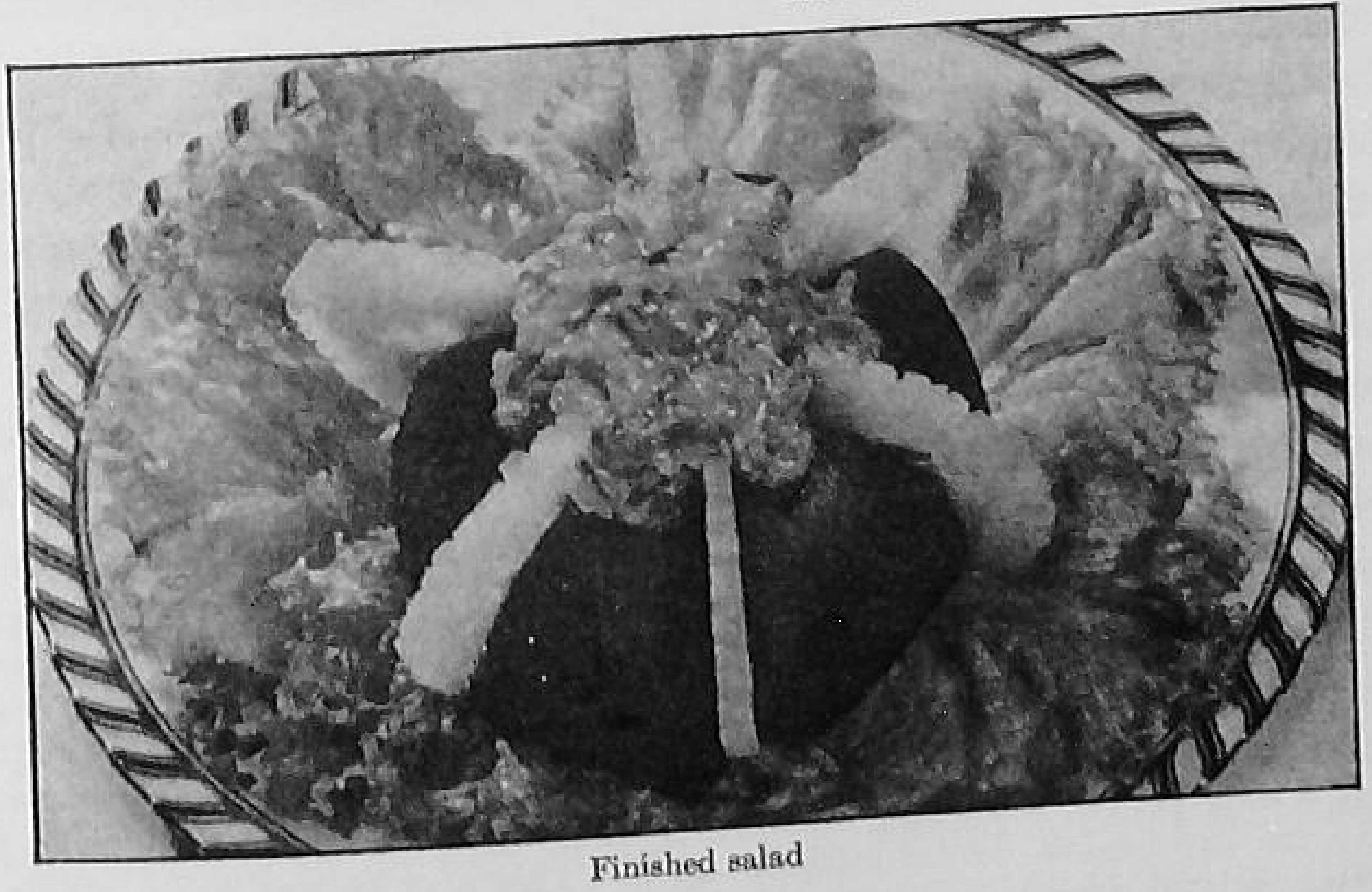
Scoring and slicing cucumber



Cutting peeled tomato



Inserting cucumber slices in tomato



Finished salad

Fig. 42

Tomato pinwheel salad is simple and quickly made, but is colorful and attractive.

Courtesy of H. J. Heinz Co.

chilled, moist ingredients, freed of all excess liquid, are placed in a salad bowl large enough to permit easy mixing. Just enough dressing is added to give the right zest to the salad, keeping in mind that the foods, not the salad dressing, are to be emphasized. The mixture is then tossed lightly with a fork until mixed. Care should be taken not to break or mash the pieces.

Salad dressings

Three types of salad dressing are in common use: cooked, French, and mayonnaise. The cooked salad dressing is a sauce thickened upon cooking either by flour, starch, eggs, or a combination of these. It contains a rather large amount of acid to be combined with milk and eggs; hence there is danger of curdling. Consequently, directions for making usually cite precautions in methods of mixing and cooking. The ingredients used in cooked salad dressings vary greatly. They include liquid, which may be water or milk, with either vinegar or an acid fruit juice, or all fruit juice; and seasonings include sugar, salt, and others such as mustard, paprika, celery salt, and onion salt. Butter, bacon fat, or some other fat is usually added. Cooked salad dressing is inexpensive and is usually well liked.

French dressing is an oil dressing and, as made in the home, is a temporary emulsion.[1] Usually about three parts of oil to one of acid are used. This mixture is shaken or beaten with the seasonings until all are blended. It should be mixed or shaken immediately before use. The seasoning of French dressing varies from the use of salt and pepper only to the inclusion of paprika, sugar, honey, and a wide variety of herbs. The amount of the sweetening agent added affects the flavor and also the consistency of the dressing. A French dressing with a high sugar content may have a jelly-like consistency when made and may remain an emulsion for some little time. Variety is secured in French dressing by the addition of such ingredients as chili sauce, catsup, chopped green peppers, pickles, capers, onions, crisp bacon, and olives. A dressing closely resembling the French dressing has condensed tomato soup as a basis. The blending of oil, acid,

[1] An emulsion is a dispersion of one liquid within another. The dispersed liquid is in the form of minute droplets. The other liquid forms a continuous phase around the dispersed liquid. Emulsions may be temporary or permanent. The temporary emulsion lasts for a short time, perhaps a few minutes. A permanent emulsion lasts for quite a long period, frequently for weeks. A permanent emulsion requires, in addition to the two liquids, an emulsifying agent. This may be egg yolks, whole eggs, egg whites, gelatin, starch, or a variety of gums, or any one of a number of powders as well as other substances.

and seasonings with the tomato soup results in a more or less permanent emulsion. Powders such as paprika and ground mustard are effective as aids in forming emulsions. Commercially made French dressings are frequently permanent emulsions. They are red with paprika. The emulsifying agent is probably the seasonings that are present as powders in amounts large enough to act in this capacity. A well-seasoned French dressing is often used as a marinade, a preparation in which certain cooked foods such as diced potatoes, green beans, and diced meat are allowed to stand for some time to improve their flavor. The process is called marinating.

Mayonnaise — mayonnaise dressing according to definition — "is the emulsified semisolid food prepared from edible vegetable oil, one or both acidifying ingredients specified in paragraph (b) of this section and one or more of the egg-yolk-containing ingredients specified in paragraph (c)."[1] Acidifying ingredients listed are vinegar or vinegar diluted with water or lemon or lime juice. Egg-yolk-containing ingredients are liquid egg yolks, frozen egg yolks, liquid whole eggs, frozen whole eggs or any one or more of those listed with liquid egg white or frozen egg white. Salt, a sweetening agent and spices may be added. The finished product must contain not less than 65 per cent of oil. Dressings which do not meet these specifications are sold as "salad dressings" or "whips."

Mayonnaise dressing is a permanent emulsion of fat in water. When appreciable amounts of oil and water alone are mixed, separate layers form; consequently, to make a permanent emulsion, an emulsifying agent must be used. Egg yolk is probably the most satisfactory of the commonly used agents. When mayonnaise is made in the home or laboratory, gelatin, starch paste, and gums may also be used as emulsifying agents. The starch paste should be used while it is still viscous, before it has set or formed a gel. In making mayonnaise an oil, such as olive, cottonseed, corn, or peanut oil, is preferred, but a solid fat may be used. The solid fat should be softened before it is added to the mixture. Butter makes a dressing that is considered highly desirable by many.

Much beating is required to obtain a good mayonnaise. It is especially important at the beginning of the process that the mixture be emulsified before more oil is added. As the volume of the emulsion increases, a larger volume of oil can be added each time without danger of breaking the emulsion. The bowl and beater selected should be of a shape and size that allow the mixture to be well beaten. Too shallow a bowl will result in

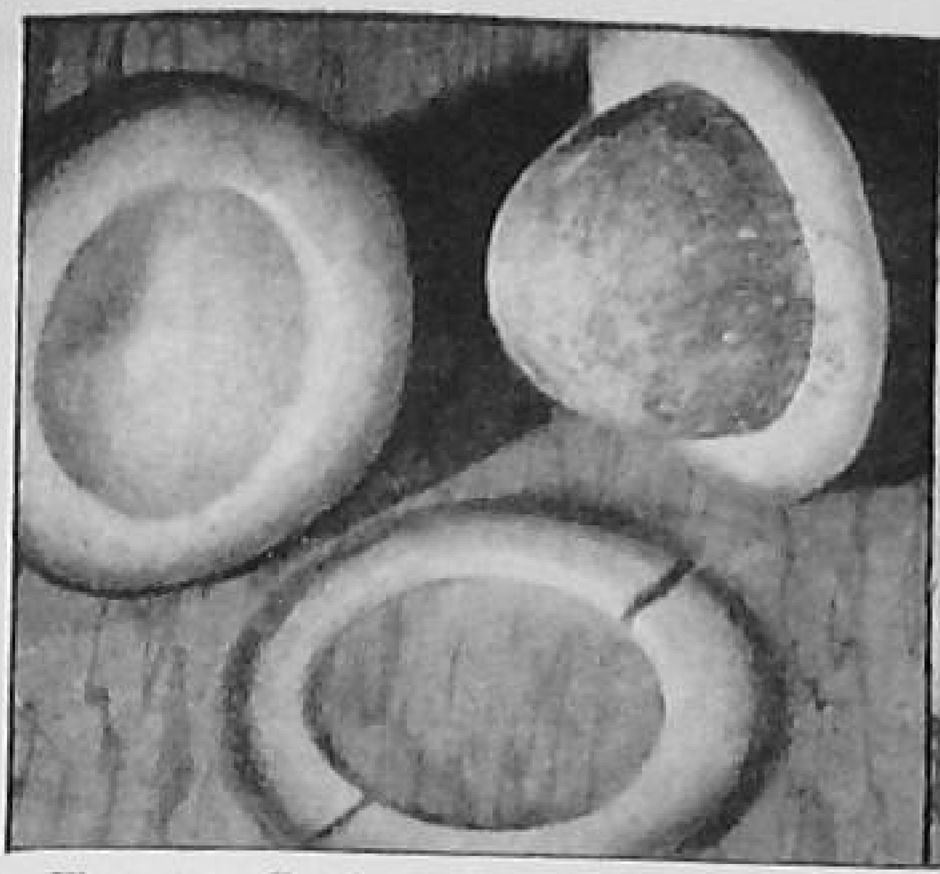
[1] Food and Drug Administration, Social Security Agency, 1949 Ed. Code Federal Regulations (b) Dressings for foods, Section 25, p. 54.

spreading the egg yolk into a thin film so that little or no mixing is possible. The beater should be placed well down in the mixture. Beating may be continuous or intermittent. Pausing a short time during the process is not harmful to the product.

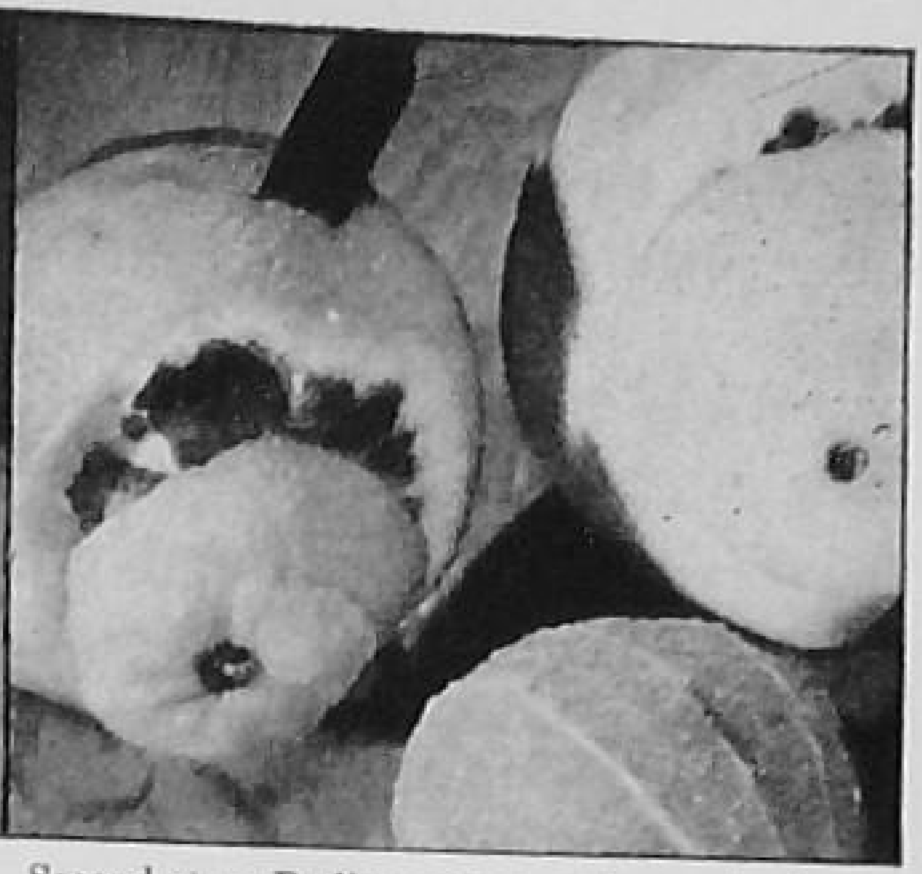
The order of combining the ingredients exerts some influence on the product. If the vinegar is added to the egg yolk at the beginning it makes a larger volume of the mixture in which to emulsify the oil. At first the oil should be added in small quantities. The amount added at one time should not exceed the volume of water and emulsifying agent or of the emulsified mixture, and preferably should be a little less. Although the seasonings and vinegar may be added at practically any stage of making, it is thought best to add the seasonings and at least part of the acid at the beginning. Once it was believed that all ingredients used in mayonnaise dressing should be of refrigerator temperature; later work shows this is neither necessary nor desirable. The emulsion forms more readily at a temperature somewhat above that of the refrigerator. Mayonnaise sometimes curdles or demulsifies during the process of making. Curdling may result from the addition of too much salt, from adding the oil too rapidly, from insufficient beating, or from the addition of too much oil. Demulsification, once started, is progressive. When this occurs it is necessary to start either with an egg yolk or a tablespoon of water or vinegar and add the curdled mixture slowly while beating. It is of no value to add the egg yolk or liquid to the curdled mixture.

Mayonnaise of high quality is golden yellow and palatable, and is stiff enough to hold its shape but does not show sharp-cut edges. The color of the mayonnaise is determined largely by the color of the egg yolk, although occasionally the oil has some effect. Neither the flavor nor the color of mayonnaise changes much after it is made. The acidity is usually high enough to delay spoilage. The consistency of the mayonnaise frequently changes due to demulsification of the dressing. A common cause of such demulsification in mayonnaise is stirring or shaking. Agitation not only forms an emulsion but may also break it. After the mayonnaise is once made it should be stirred as little as possible. The fact that shaking during transportation may break the emulsion offers a special problem to the commercial producer. Storage at too low or at too high a temperature and exposure to air affects the emulsifying agent and may cause the mixture to curdle.

Cream dressing has long been popular for slaw and today when sour cream is so readily available, sour cream dressings are increasingly popular. They are easily made by blending vinegar or lemon juice and seasonings with the sour cream.

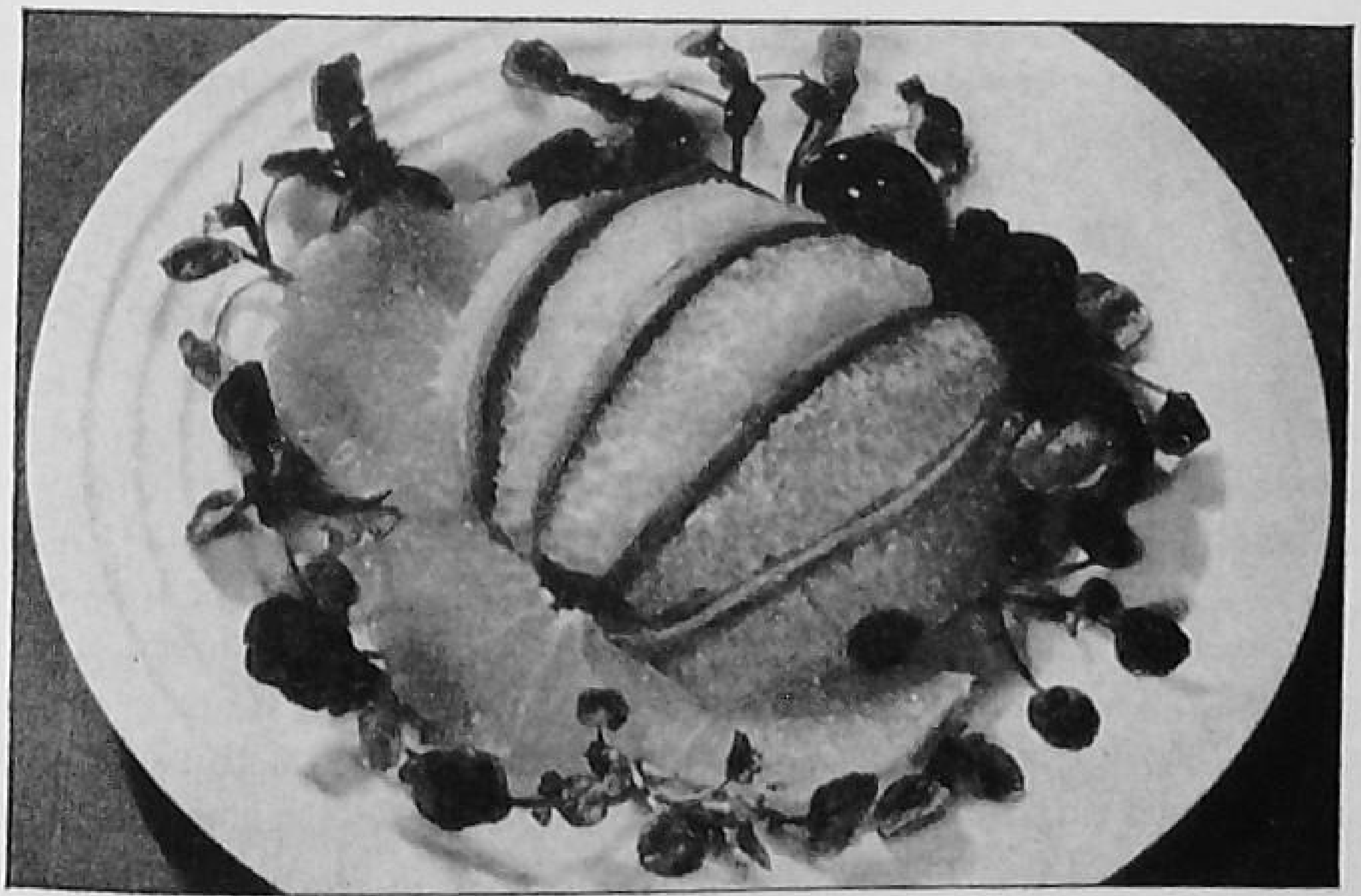


First step: Cutting and slicing avocado



Second step: Peeling orange and grapefruit

Third step: Slices of orange and sections of grapefruit



Finished salad

Fig. 43

Slices and sections of orange and grapefruit with the membrane carefully removed make an attractive salad combined with avocado and garnished with water cress.

Courtesy of H. J. Heinz Co.

Because the dressing may make or mar the salad, care should be given to its selection. A cooked dressing is often preferred for fish, meat, and vegetable salads, and is sometimes used for fruit salads. French dressing is especially suited for use on head-lettuce salad, or on a salad composed of any other salad greens. A plain French dressing may be varied to add interest, as suggested in Table 29. The dressings used on salad greens

TABLE 29. SUGGESTED VARIATIONS FOR SALAD DRESSINGS

Cooked	French	Mayonnaise
Use various fruit juices for acid and liquid Add: Whipped cream Horseradish Chopped pimento	Add: A cut clove of garlic Roquefort cheese, broken into small pieces Tomato catsup Chopped cucumber pickles or olives and hard-cooked egg Chopped green pepper, pimento, hard-cooked egg, drained chili sauce, catsup, and Worcestershire sauce Chopped onion Chopped crisp cooked bacon Chopped or ground nuts Horseradish and chili sauce Paprika, green pepper, red pepper, shallot, olives, sweet pickle, and hard-cooked egg Cream cheese Tomato juice and garlic	Add: Same as French dressing (except Roquefort cheese) Indian relish Horseradish Anchovies and capers rubbed to a paste Whipped cream Capers, parsley, and pimento Lemon juice, A-1 sauce, and chili sauce Chili sauce, green pepper, tarragon vinegar, chives, red pepper, paprika, and catsup

should be, for the most part, distinctive in flavor. In one used for fruit salads, the flavor should be more delicate, accentuating rather than concealing the fruit flavor. The use of lemon, orange, lime, or grapefruit juice in place of vinegar produces a dressing especially suitable for fruit salads. If the juice is mildly acid, the proportion of oil may be reduced. French dressing coats the food so readily and completely that it is easily used. It does not mask the foods nor conceal their identity as a thicker dressing may. Hence French dressing is suitable for a salad with a special form or arrangement. Plain mayonnaise dressing may be used with fish, vegetable, and meat salads and sometimes with fruit salad. The dressings may be varied to suit the taste and the salad being made.

Service

The type of salad one chooses to serve should be determined largely by its place in the meal. As an accompaniment to the main course, a light vegetable or fruit salad is usually selected. A light salad is also preferred for the salad course in a meal in which there are more substantial dishes. However, when the salad is the main dish, a combination of vegetables with a protein-rich food such as fish, chicken, meat, cheese, or nuts is desirable. In this salad a richer dressing is frequently used.

The salad bowl, a bowl in which the salad foods are lightly tossed with a suitable dressing, makes an attractive addition to any table. The salad may be served at the table and the size of the serving may be large or small as desired. If preferred, the salad may be served in individual salad bowls or attractively arranged on a cold plate. A lettuce leaf cup or a bed of shredded salad greens usually forms the foundation on which a suitable amount of salad is placed. As a rule the salad covers only about half the plate. Simple salads attractively arranged are desirable. Even for special occasions "candle salad," "butterfly salad," and "rabbit salad" are best avoided. Garnishes may, however, add to the attractiveness of certain salads. A sprig of water cress or parsley, a ripe olive, a small pickled beet, a stuffed prune, or a dark plum may add just the contrast in color or form needed. The garnish should, for the most part, be edible. It may be the salad dressing on which a dash of paprika or a bit of chopped parsley or water cress is sprinkled, or it may be chopped olives, green or red pepper, pimento, or nuts. Sometimes slices of hard-cooked egg, a ring of green pepper or onion, or a strip of pimento is placed directly on the salad.

When a salad forms a separate course, suitable accompaniments should be served with it. The simplest of these is saltines or plain salted crackers, which may or may not be sprinkled with cheese and heated. Cheese straws are excellent with fruit salads and may also be used with vegetable salads. Cheese balls, as well as other forms of cheese, are frequently served. Small crisp rolls, dainty sandwiches, unsweetened wafers, salted nuts, olives, and potato chips all have their place as salad accompaniments.

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ACTIVITIES

1. Prepare salads from raw vegetables, selecting from among the following:[1]

Alone	Chicory Chinese cabbage Endive Escarole Lettuce Romaine Spinach Water cress
Cabbage alone or with	Apples Celery Celery and pineapple Cucumber Green peppers Nuts Pickled beets Pineapple Radishes and onions Raw carrots
Cauliflower alone or with	Carrots and green peppers Celery and tomatoes
Celery alone or with	Almost any fruit or vegetable Apples and grapefruit Apples and pineapple Apples and nuts Carrots
or stuffed with	Cheese or peanut butter
Cucumbers alone or with	Green peppers, onions, and radishes Raw carrots Shredded lettuce Tomatoes
Green peppers with	Celery and carrots Cream or cottage cheese Pimento Rings of onion and red pepper

[1] Each salad should be served with a suitable salad dressing.

Tomatoes alone or with...	Avocado Celery Cucumbers Radishes, green peppers, and cucumbers Water cress
or stuffed with.........	Apples and celery Chicken salad Cottage cheese, green peppers, and onions Diced celery and cucumbers Fish salad Grapefruit, celery, green peppers Pineapple and nuts Shredded cabbage and chopped green peppers

2. Prepare salads, using cooked vegetables and selecting from among the following:[1]

Asparagus tips with.......	Beets or kidney beans Lettuce and pimento Peas and cauliflower Tomatoes
Beets alone or with.......	Beans, peas, cauliflower, and asparagus Carrots, beans (string, lima, or kidney) Cucumber
Peas with...............	Celery or carrots Cheese and pickles Peanuts and pickles Variety of vegetables
Potatoes with...........	Beets, carrots, lima beans, and string beans Carrots, sweet potatoes, turnips, and string beans Celery, nuts, hard-cooked eggs, onions, and pickles Celery, peas, or mushrooms Cucumbers, radishes, celery, and grated onion
String beans alone or with..	Beets Variety of vegetables

[1] Each salad should be served with a suitable salad dressing.

3. Prepare salads, using fresh fruits, selecting from among the following:[1]

Apples with	Cheese and nuts
	Dates or raisins
	Nuts and celery
	Oranges and dates
	Oranges, grapefruit, and bananas
	Pineapple or peaches and grapes
Apricot halves filled with	Blanched almonds and raisins
	Celery and nuts
	Cream cheese and pecans
	Grapefruit
	Grapes
Bananas with	Apricots
	Grapes and oranges
	Mixed fruits
	Nuts
Grapefruit with	Apricots
	Avocado strips
	Celery
	Endive
	Orange sections
Melon balls or slices alone or with	Blueberries
	Mixed fruits
Oranges with	Dates and nuts
	Grapefruit sections
	Mixed fruits
	Onions
	Pineapple and raisins
	Sliced tomatoes
	Water cress
Peach halves filled with	Blanched almonds and raisins
	Celery and nuts
	Cream cheese and pecans
	Grapefruit
	Grapes

[1] Each salad should be served with a suitable salad dressing.

Pear halves filled with.....	Blanched almonds and raisins Celery and nuts Cream cheese and pecans Grapefruit Grapes
Pineapple with...........	Cream, cottage, or American cheese Strawberries Variety of fruits and vegetables

4. Prepare meat and fish salads, selecting from among the following:[1]

Chicken	Salmon
Crabmeat	Shrimp
Halibut	Sweetbread and cucumber
Ham	Tuna fish
Lobster	Veal
Oyster	

5. Prepare egg salads.[1]
6. Prepare cheese salads.[1]
7. Prepare gelatin salads.[1]
8. Prepare frozen salads.[1]
9. Prepare and evaluate salad dressings characteristic of each of the principal types, such as:

Cooked	Mayonnaise
French	Mayonnaise with starch filler
Fruit	Tomato French

Refer to *Practical Cookery*, "Salads and Salad Dressings," pp. 148–157; Heseltine and Dow, *The Basic Cook Book*, "Salads and Salad Dressings," pp. 413–441.

Recipes for products selected not included in these references are to be supplied by the instructor.

Milk and Milk Products

MILK. The secretion of milk is, like the fruiting of flowers, a part of nature's provision for the perpetuation of certain species. It is easy to understand how man came to divert nature's provision for certain plants to meet his needs and thus safeguard further the perpetuation of his own

[1] Each salad should be served with a suitable salad dressing.

kind, but how and when he began to utilize the milk secreted by other species to this end is a matter of conjecture. Whether by observation, imitation, or reasoning, milk other than human came to be included in man's diet is not known. It is known, however, that from the earliest days of recorded history animals that supplied man with milk have had their place among his valued possessions.

The association between the abundance of that which is good and an abundance of milk is shown in the Biblical description of Canaan as a land which "floweth with milk and honey." Though cows have been, and still are, the chief source of milk, people of many lands and times have used milk from goats, sheep, camels, buffalo, reindeer, and wild asses. Though Roman myth attributes some of the characteristics of Romulus, the founder of Rome, and Remus, his twin, to the milk of the she-wolf that nurtured them, there is little indication that any special qualities may be derived from milk of canine sources.

It is a far cry from the primitive times when roving man took his herd with him and drew his sustenance as needed to the present day when the homemaker may open the door as she prepares breakfast and pick up a container of milk delivered during the night. Generally, milk so delivered has printed on the bottle cap or on the container information concerning the processing it has been given, the name of the dairy handling it, and the grade of the milk. This change in method makes an interesting story typical of the evolution of the production, transportation, and marketing of a present-day food.

As long as each family had its own animals, whether goat, sheep, cow, buffalo, or reindeer, as a source of milk, difficulties in milk transportation were unknown. This problem developed with the growth of cities. To meet it, various schemes were evolved. A simple solution was to drive the goat, cow, or other animal to the customer's door, or perhaps into the house, and to draw the milk there. A later custom, practiced even today in some countries, was to take the milk from house to house in large open containers. At each stop as much milk as desired was dipped out and poured into the pitcher, bucket, or other container provided by the consumer. A similar, though definitely more sanitary method was to haul the milk in large closed containers and draw it out through a faucet as needed. Today large dairy farms, often far from the centers of consumption, specialize in the production of milk of high quality. It may be delivered to creameries by rapid transportation in huge trucks especially equipped with glass-lined tanks. There it may receive further treatment, after which it is delivered to the consumer or retailer in half-pint, pint, quart or half-gallon containers.

Production

It is estimated that close to sixty billion quarts of milk are produced annually in the United States. Profit to the milk producer is largely dependent upon the yield of milk per cow. This yield may be increased by careful selecting and breeding and by superior care and feeding. This has resulted in an increase in the average production of milk per cow in the United States from 4,622 pounds in 1940 to 5,328 pounds in 1952, but the average by states varied from about 7,700 pounds in California to 2,500 pounds in Louisiana. It is noted that the average per cow in the Netherlands was 8,333 pounds and that in a number of countries the average yield was in excess of 6000 pounds.[1]

As the quantity of milk produced and marketed increased, interest in the production of a safe, clean product, acceptable to consumer and inspector alike, increased. Diseases of either human or bovine origin may be readily spread by milk not properly handled. In order that milk of high quality will be marketed, The Public Health Service publishes "The Milk Ordinance and Code." This is reprinted from time to time and occasionally changes are made in it.

The 1953 Recommendations of the Public Health Service [2] lists twenty-four points concerned with the production of safe milk. The first of these has to do with the health of the cow; six are concerned with the conditions under which the cows are kept not just at milking time but at all times; others mention the health and sanitary practices of the milkers and those handling the milk; seven mention the utensils and rooms used in handling the milk; and the last two are concerned with prompt cooling of the milk and keeping it cool.

Much has been done to eliminate diseased animals from dairy herds and to emphasize the importance of permitting only healthy individuals to handle the milk. As given in 1918, satisfactory methods of producing milk of low bacterial count required clean cows with clean udders and teats, the sterilization of utensils and a pail with a small top.[3] Although today, use of milking machines may have changed the emphasis slightly as regards the importance of the pail with the small top, it has in no way minimized the need for sterilization of all equipment and the maintenance of clean, sanitary conditions wherever milk is being handled. To keep the count

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

[2] Milk Ordinance and Code. 1953 Recommendations of the Public Health Service, Public Health Service Publication No. 229.

[3] S. H. Ayers, L. B. Cook and P. W. Clemmer, *The Four Essential Factors in the Production of Milk of Low Bacterial Content*, United States Department of Agriculture Bulletin 642, April, 1918.

low, milk should be rapidly cooled to 50° F. (10° C.) or less, and should be held at a low temperature.

Pasteurized milk

In spite of the emphasis placed upon the production of milk of low bacterial count, the public health value of pasteurization is unanimously agreed upon by health officials. Pasteurized milk is milk which has been heated to devitalize all milk-borne pathogens. This may be accomplished by either the "hold" or the "flash" method. According to the United States Public Health Service Milk Ordinance and Code, "The terms 'pasteurization,' 'pasteurized,' and similar terms shall be taken to refer to the process of heating every particle of milk or milk products to at least 143° F., and holding at such temperature continuously for at least 30 minutes, or at least 161° F. and holding at such temperature continuously for at least 15 seconds, in approved and properly operated equipment. . . ."[1]

Pasteurized milk is equal to raw milk in nutritive value except for the vitamin content. According to Kay,[2] pasteurization of milk by the "hold" method gives a 20 to 25 per cent loss of thiamine and a 20 per cent loss of the original ascorbic acid content. The extent of the destruction of ascorbic acid is dependent upon the exact method employed. The use of pasteurized milk supplemented by foods rich in this vitamin is believed preferable to the use of raw milk because of the decreased danger of bacterial contamination. It is even recommended that before milk be classed as "safe milk" it must have been both "properly produced and properly pasteurized."[3] The process when properly executed offers almost complete insurance against the transmission of disease by milk.

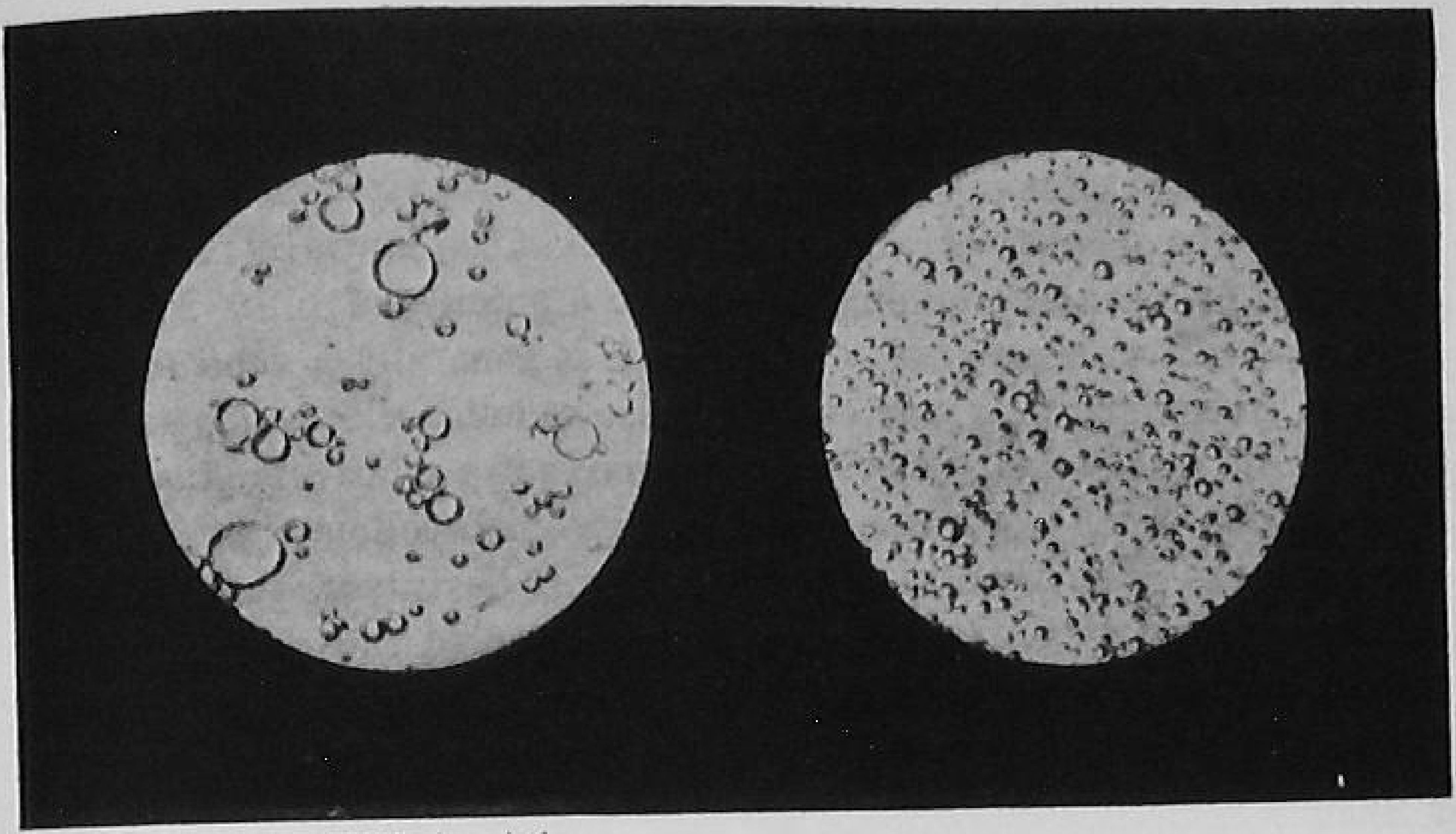
Homogenized milk

Much of the fluid milk on the market has been homogenized. Homogenization is carried out by forcing milk through small openings under high pressure. This treatment decreases the size of the fat globules and increases the stability of the emulsion so no cream line is formed upon standing. The milk remains quite uniform throughout the container and is said to possess a richer flavor due to the dispersion of the fat. Many persons who once used cream or top milk for cereals and coffee now find

[1] Milk Ordinance and Code. 1953 Recommendations of the Public Health Service, Public Health Service Publication No. 229.

[2] H. D. Kay, "Pasteurization of Milk: Some Recent Aspects," *Nutrition Abstracts and Reviews*, 9:1:1–11 (July, 1939).

[3] L. C. Frank, "A National Program for the Unification of Milk Control," *Public Health Reports*, vol. 41, part 2, July 30, 1926, pp. 1583–1604.



Courtesy of Evaporated Milk Association

Fig. 44

Homogenization reduces the size of fat globules in milk and thus prevents their separation. Left, butterfat globules in untreated evaporated milk. Right, fat globules in homogenized evaporated milk. Magnified 1000 times.

homogenized milk satisfactory. Homogenization has greatly increased the surface area of the fat and so has increased the tendency toward rancidity. Pasteurization may reduce this tendency by destroying the enzymes which would otherwise cause a breakdown of the finely divided fat. Homogenization apparently decreases the stability of the protein in the milk so that under certain conditions of heating coagulation occurs more readily than when unhomogenized milk is used. This is especially evident in the making of white sauces, gravies, and escalloped potatoes.

Food value

The recommendation of the Bureau of Human Nutrition and Home Economics that the equivalent of 260 quarts of milk be included in the diet of every active man and woman each year indicates the importance of this foodstuff. Studies carried on in different sections of the country and in different types of communities indicate that actually an average of 225 quarts of milk[1] were included in the diets graded as good, but the national average for all persons is near 175 quarts.[2] Milk contains all substances

[1] United States Department of Agriculture, *Yearbook of Agriculture, 1939*, p. 328.
[2] *Agricultural Statistics 1953*, United States Department of Agriculture.

known to be essential to successful nutrition, but it is so low in iron that nutritional anemia is developed on a strict milk diet. Milk is especially valuable as a source of calcium and protein. It also contains phosphorus, fat, and vitamins in varying amounts. Its vitamin A potency is variable. The quantity of carotene in the diet of the cow is by far the most important factor in determining the vitamin A potency of milk. Milk from cows on a diet of silage, hay, or pasturage is generally a good source of vitamin A; summer milk may contain twice as much vitamin A as winter milk. Milk is only a fair source of thiamine, but a relatively good source of riboflavin, which is associated with the greenish-yellow pigment of the whey of milk. The riboflavin of milk is readily destroyed by light so the current practice of marketing a large proportion of the milk in opaque cartons is undoubtedly of value in the retention of riboflavin. Freshly drawn milk contains appreciable amounts of ascorbic acid and, according to certain experimental work, the amounts remain quite constant from season to season irrespective of the ration. The ascorbic acid is unstable when heated in the presence of oxygen. If copper is present, the rate of destruction is even greater. Hence pasteurized milk may have a considerably reduced ascorbic acid content. Summer milk may be nine times as rich in vitamin D as winter milk, mainly because of the greater exposure of the cow to sunlight.

The nutrients in milk, as might be expected, are especially well utilized by the body.

TABLE 30. AVERAGE COMPOSITION OF MILK

	Per cent
Carbohydrates	5.
Protein	3.3
Fat	4.
Water	87.
Ash	0.7

The carbohydrate in milk is lactose. The fat is in an emulsified form, so is readily acted upon by the digestive juices. The chief protein in milk is casein, which forms about 2.8 per cent of whole milk and 80 per cent of the protein. Casein is considered the chief protein because of the quantity present, its food value, and the part it plays in cheese-making. In fresh milk the casein is largely in combination with calcium salts, hence it is known as calcium caseinate. This is not in solution but is suspended in the milk in minute solid particles. Practically all of the solids of milk are

in suspension in the water, forming an opaque colloidal solution. Lactalbumin, the protein of milk second in importance, is present in much smaller quantities, forming only about 0.5 per cent, while the protein lactoglobulin, ranking third in amount, forms only 0.05 per cent, so small a proportion that it may be forgotten in considering the use of milk in cookery. The composite protein comprised of these is adequate or complete for body needs if used in sufficient quantity.

In spite of the high nutritive value of milk, suggestions are made from time to time that it be "improved" by fortification. However, increasing the vitamin D content seems to be the only suggestion that has had wide acceptance. This may be done by feeding the cow vitamin D concentrates, by irradiating the milk, or by the addition of vitamin D concentrates to the milk. To many, the first method is preferable. The vitamin A value of the milk has been increased during the winter by improved feeding practices although it may be that additional improvement is desirable.

Heating milk

Although milk is consumed in great quantities as a beverage, it is also important in food preparation. In the preparation of many dishes, the milk is first heated or scalded. When fresh milk is heated for a short time, two physical changes are obvious: first, a film forms on the surface; and second, a coating forms on the utensil and is visible when the milk is emptied. The formation of the film, which is composed largely of calcium caseinate, is accelerated by exposure to the air and the presence of fat. The coating on the utensil is coagulated albumin with such calcium salts as may have been occluded with it. Continued heating often results in coagulation or curdling of the casein. This apparently occurs more readily when homogenized milk is used and when salt has been added. It is frequently observed in milk dishes cooked in the oven. Less obvious changes which occur in heated milk are alterations of odor and flavor due to loss of the dissolved gases such as carbon dioxide and oxygen and perhaps to caramelization of the lactose. There is partial or total destruction of ascorbic acid and precipitation of some of the calcium phosphate, the amount depending on the degree of heating. Excess heat causes changes in the casein and discoloration of the milk due to caramelization of the lactose. Another change, of limited importance from the standpoint of cookery but of vital concern to the producer of pasteurized milk, is the dispersion of the clumps of fat. A relatively high temperature increases the dispersion, causing a decrease in the quantity of cream obtained from

a given amount of milk. This change occurs suddenly at about 62° or 63° C. (144° or 145° F.), approximately the temperature used for pasteurization. Before opaque milk cartons and homogenized milk were so widely accepted, the quality of milk was often judged by the depth of the cream line, so care was necessary to avoid a lowered cream line. The viscosity of milk is affected by heating. Hot milk is less viscous than cold. When cooled, milk heated to 60° to 65° C. (140° to 149° F.) is less viscous than before heating. However, milk heated to 80° C. (176° F.) or above is more viscous when cooled than it was before heating.

Souring of milk

The souring of milk is due to lactic acid bacteria which act on the lactose, forming lactic acid, which is responsible for the sour taste. Although milk is a suitable medium for growth of many organisms, under normal conditions, after the first few hours the development of lactic acid bacteria exceeds that of other organisms. The development of other bacteria is suppressed by the increase in acidity. As lactic acid is formed, it acts upon constituents of the milk other than lactose. Of these, calcium caseinate is most affected. The lactic acid and the calcium combine, leaving free casein. The free casein is not stable as a colloid, so partially precipitates, forming the gel, or the familiar curd of sour milk.

The rate at which these changes occur is largely dependent upon temperature. The optimum temperature for this change is about 40° C. (104° F.). At lower temperatures the change takes place much more slowly. When the curd is first formed, the whey or milk serum is held within the meshes of the clot, but as the degree of acidity increases, the clot contracts, exuding the whey. The application of heat hastens these processes. Use is made of this in the preparation of cottage cheese. The whey or exudate contains the lactose not utilized by the bacteria, the soluble salts, some vitamins and suspended fat, and, if heat has not been applied, the albumin and globulin. The curd, used as cheese, is chiefly coagulated casein, though it also contains some fat and minerals.

Casein is soluble in an alkaline medium. Hence baking soda is often added to sour-milk products or to combinations of milk and acid foods not only to neutralize the acid but also to dissolve the casein or curd.

Action of rennin

A proteoletic enzyme, frequently referred to as rennin, causes the coagulation of milk. Use is often made of this quality in the preparation of certain desserts and of cheese. Fresh milk, acted on by rennin at a

temperature of about 37° C. (99° F.), forms a smooth, gel-like curd. Commercial rennin is commonly obtained from the stomach of the calf. It is made into a concentrated extract known as rennet, or into tablets known as junket. Rennin is exceedingly potent, one part clotting from two to three million parts of milk.

A number of factors affect the rate of change and the character of the clot formation. Of these temperature is important. For the rennin ordinarily used, 40° to 42° C. (104° to 108° F.) is the optimum. Above this temperature the clot tends to be tough and stringy, and below, it is too soft. However, no coagulation occurs below 10° to 15° C. (50° to 59° F.) or above 60° to 65° C. (140° to 149° F.). Previous boiling of milk retards the rate of coagulation and alters the character of the clot. This is apparently due to the relationship between the calcium and the casein, the nature of which is not clearly understood. The degree of acidity also controls the reaction. A slightly acid condition is the most favorable for clotting, though further increase in acidity tends to inhibit the action of rennin. The presence of sufficient acid to cause the coagulation of casein entirely prevents clotting by rennin. The concentrations of casein and calcium, too, exert considerable influence. For example, dilution of milk with water greatly interferes with the rate of coagulation. The characteristics of the milk itself also affect the curd. Milk from certain cows produces so-called "soft curds." "Soft-curd milk" was at one time given considerable publicity as being superior for infant feeding, and milk from certain cows was valued. Today homogenization, high-temperature treatment, sonic vibrations, the addition of enzymes or base-exchange processes may be used to alter the milk so a softer curd results.

Processed milks

By definition "milk" must contain not less than 3.25 per cent butter fat. Perhaps because of increased interest in the caloric value of foods or possibly for economical reasons skim milk or other fluid milk of reduced fat content is found on many markets. Such milk is lower in energy value and in the fat soluble vitamins but may be an economical source of the other nutrients found in milk. It differs in flavor from the whole milk, a fact probably most evident when used plain as a beverage. It can be used in food preparation essentially the same as whole milk.

There is much interest in frozen milk. It is well known that slow freezing, such as may occur when milk is left on the doorstep on a cold morning, has a distinct effect upon the milk, tending to destroy the emulsion of the fat globules. Rapid freezing of concentrated pasteurized milk under con-

trolled conditions may eliminate these changes. When held at -10° F. the milk may later be reconstituted to give a product closely resembling the fresh fluid product. At the present time the frozen product cannot compete economically with fresh milk in regions where the latter is readily available.

Sterilized milk which retains its original flavor and nutritive value is being produced in limited quantities. The milk is protected from exposure to the air from cow to can. It is homogenized, flash-heated to 285° F., cooled and canned. It too is for use in regions where fresh fluid milk is not a competing product.

Because of the bulk of fluid milk there has long been an interest in a concentrated product which when reconstituted would have all the properties of fresh fluid milk. A satisfactory concentrated milk, one-third the volume of the original product, has been produced and marketed experimentally. Concentrated milk products recognized by the Public Health Service include homogenized concentrated milk, vitamin D concentrated milk, concentrated skim milk, concentrated flavored milk, concentrated flavored drink and similar concentrated products.

Other processed milks which do not offer the problems of storage and transportation of fresh milk and which differ somewhat from the fresh fluid milk when reconstituted have been used for greater or lesser periods of time. Evaporated, condensed, and dried milk are best known, but condensed buttermilk, condensed skim milk, malted milk, dried buttermilk, and dried cream are also successfully prepared.

Evaporated milk is prepared from whole milk by the evaporation of water. By definition "Evaporated milk is the liquid food made by evaporating sweet milk to such a point that it contains not less than 7.9 per cent of milk fat and not less than 25.9 per cent of total milk solids."[1] It is homogenized and is sealed in a container and processed by heat to prevent spoilage.

Sweetened condensed milk differs from unsweetened evaporated milk in that it has added to it from 15 to 18 per cent sugar, either sucrose or dextrose, so that the final product contains from 40 to 45 per cent sugar. Sweetened condensed milk may be filled into cans and sealed, but the concentration of sugar is such that sterilization is not necessary for preservation. It is often packed in bulk when intended for use in large quantities.

In the production of dried milk, the first step may be its partial concentration in vacuum pans. It may then be dried on heated rollers, either at

[1] "Definition and Standard of Identity of Evaporated Milk" as promulgated by the Food and Drug Administration of the Federal Security Agency, 1940.

normal air pressure or under a partial vacuum. A second method much used in the preparation of dried milk intended for human consumption is the spray method. In the form of a fine mist, milk is sprayed into a heated chamber, where it dries almost instantly and drops to the floor as a powder. Dried whole milk contains not less than 26 per cent of milk fat and not more than 5 per cent of moisture. Dried skim milk, now termed "nonfat dry milk solids," "defatted milk solids" or "nonfat milk solids," also contains not more than 5 per cent moisture. Dried whole milk should be kept cool and dry. Nonfat dry milk solids, because of the low fat content, have better keeping qualities than dry whole milk, although methods have been found for treating dried whole milk to improve its keeping quality. Dried milk, either whole or skim, may be satisfactorily substituted for the fresh product in most instances. An increased amount of the solids may be added to some foods to supplement the food value.

Other processed milks include buttermilk, cultured milk, cultured buttermilk and fermented milks as acidophilus milk and kumiss.

The food value of the processed milks is similar to that of fresh milk except as fat and fat soluble vitamins have been removed to give a skim-milk product and as certain vitamins have been affected by exposure to heat, oxygen and possibly light.

The estimated yearly per capita milk consumption in the United States for 1935–39 was 791 pounds (fluid milk equivalent basis), but in 1953 the figure dropped to an estimated 689 pounds.[1] It is estimated that between 40 and 50 per cent of the milk is consumed as fluid whole milk and cream; the remainder is used mainly as fluid skim milk and buttermilk, butter, cheese, condensed and evaporated whole milk, dry whole milk, nonfat dry milk solids and ice cream.[2]

According to the Bureau of Agricultural Economics, the production of dry whole milk reached a peak in 1945 and since that time has gradually declined. Nonfat dry milk solids although showing some decline in production since 1949 show an increase in per capita consumption. In 1952 this was given as 4.4 pounds as compared with 2.2 pounds in 1940.[3] The per capita consumption of evaporated and condensed milk was estimated at 17.4 pounds in 1952, somewhat less than the 20.0 pounds utilized in 1947. Ice cream manufacturers used an estimated 7,150 million pounds of

[1] *National Food Situation*, NFS-68, Bureau of Agricultural Economics, United States Department of Agriculture, April, 1954.

[2] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

[3] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

milk (equivalent) in 1952, to make 2,826 million pounds of ice cream or enough for each person to have 17.5 pounds. This is double the per capita consumption of twenty years ago.[1]

CHEESE. Among the milk products of commercial importance are ice cream, cheese, cream, and butter. Cheese is one of the oldest of these products. It is not known when it was first used, but handed down through the centuries come legends of its origin. One of these is of an Arab who, starting out on a long journey, took with him for food and drink a quantity of milk. Lacking a convenient container, he fashioned a bottle from the stomach of a young calf. At noonday, feeling the need of refreshment, he stopped to drink the milk but noticed immediately that something unusual had occurred. Only a small amount of watery substance ran from the bag. Just what he did next is doubtful. One legend tells how, being hungry, he ripped open the bag and tasted carefully the solidified white mass which is now known to have been largely the casein of the milk coagulated by the rennin of the calf's stomach. The Arab, finding the white gel to have a mild sweetish flavor, hastened to devour it completely. Then, it is said, not waiting to complete his journey, he returned in great haste to tell his comrades of his wonderful discovery. In another legend the Arab is pictured as hanging the bag and its contents in a convenient place in disgust and continuing his journey unrefreshed. Weeks later, returning by the same route and being exceedingly hungry, he remembered the bag he had left there. When he stopped and examined its contents, the odor was so inviting that he tasted the firm curd, found it just to his liking, and after eating the entire mass hastened to tell his fellow countrymen of the new food.

The use of the curds resulting from the natural souring of the milk in all probability preceded the "cheese" obtained by the use of rennet. A few decades ago the making of cottage cheese was largely a home process. Today, practically all of the cheese produced in this country, whether unripened or ripened, is made by commercial manufacturers. Of the ripened cheeses, American or Cheddar is by far the most important in this country. In the making of Cheddar cheese, milk of a known fat content is pasteurized. The milk is then run into steam-jacketed vats, and a "starter," consisting of a lactic acid culture, is added. The milk is heated to a temperature of about 27° C. (85° F.). When the acidity of the milk is approximately 0.2 per cent, it is favorable to the "setting" of the milk by rennet. Diluted rennet is mixed thoroughly with the milk, which is then allowed

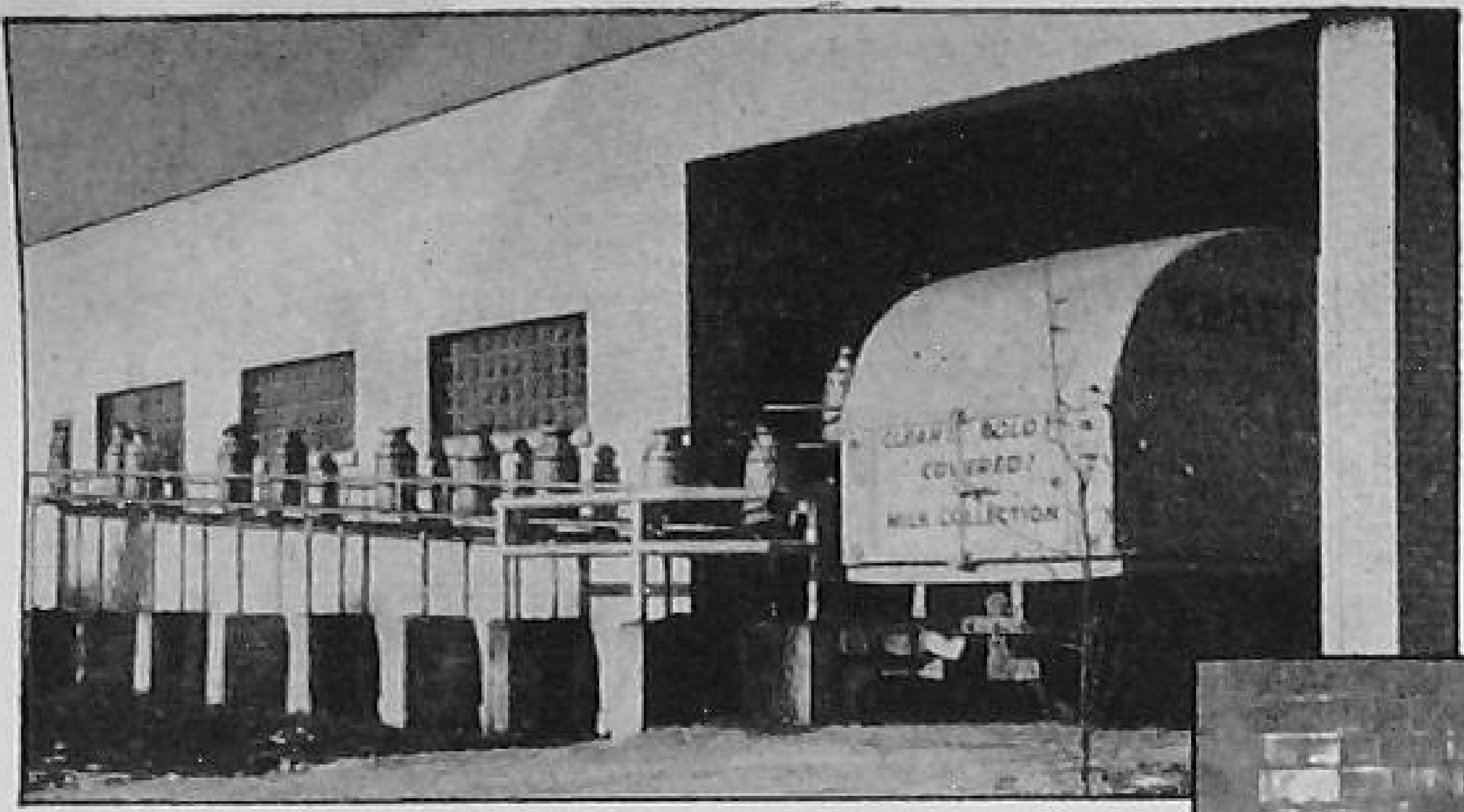
[1] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62. Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

to coagulate. The resulting curd is cut into small cubes with cheese knives and the whey is thus released from it. The curds and whey are heated slowly to approximately 37° C. (98° F.) while the mass is stirred to prevent matting of the curd. The heat causes a further separation of the whey from the curds and a corresponding reduction in the volume of the curd. When the desired temperature has been reached, the whey is drained from the curds, which are pushed to the sides of the vat to mat together into a compact mass. The matted curds are cut into strips with a knife and piled and turned to facilitate removal of the whey. Now a number of cheese plants have introduced a so-called "continuous process." The coagulated milk is pumped or allowed to flow into a second vat where it is treated with mechanical paddles and forkers in the process of removing the whey. This has the advantage of reducing hand labor. After the removal of a large portion of the whey, whether by the old method or the "continuous" method, the next step, milling or cutting, is followed by salting and packing of the curd into characteristic hoops or forms lined with cheese cloth. After being pressed twenty-four hours, more or less, to remove further amounts of whey, the cheese is removed from the mold and is coated by dipping in paraffin. This delays loss of moisture. The cheese is now ready for the ripening process. Proper conditions of temperature and humidity are necessary if the right flavor and texture are to develop. Changes in the cheese are largely dependent upon the action of bacteria and enzymes. A low temperature of from 2° to 10° C. (36° to 50° F.) with a long ripening period tends to produce a cheese superior to that ripened at a higher temperature.

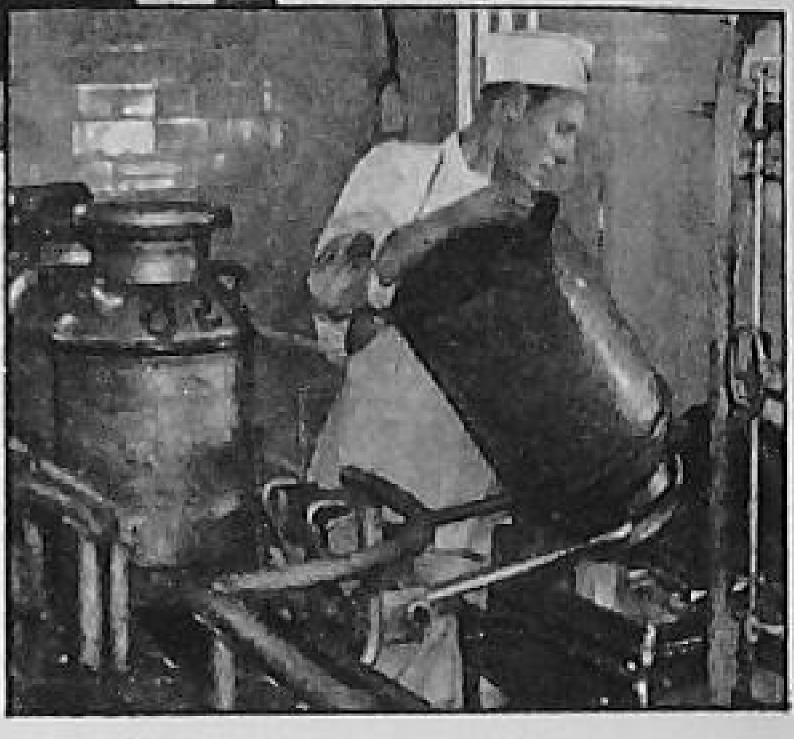
Although in this country far more Cheddar cheese is consumed than any other kind, a visit to a market dealing in cheeses will show that many varieties are available. Closer examination will show that many kinds are made in this country even though in 1951 we imported approximately 44 million pounds from other countries.[1] Certain cheeses stand out in the average display. The brilliant red or yellow balls of Edam, the golden-yellow Pineapple cheese, the small green cones of the Sapsago variety, the huge disks of Emmenthaler cheese, and the mold-streaked cylinders of Stilton are sure to be impressive.

The basis for each of these cheeses is milk. Because only the milk protein and fat, together with some minerals, are commonly used, one may well wonder how so great a variety is obtained. The addition of seasonings of various kinds exerts a minor influence, but the chief factors are the nature of the microorganisms acting upon cheese to produce the ripening

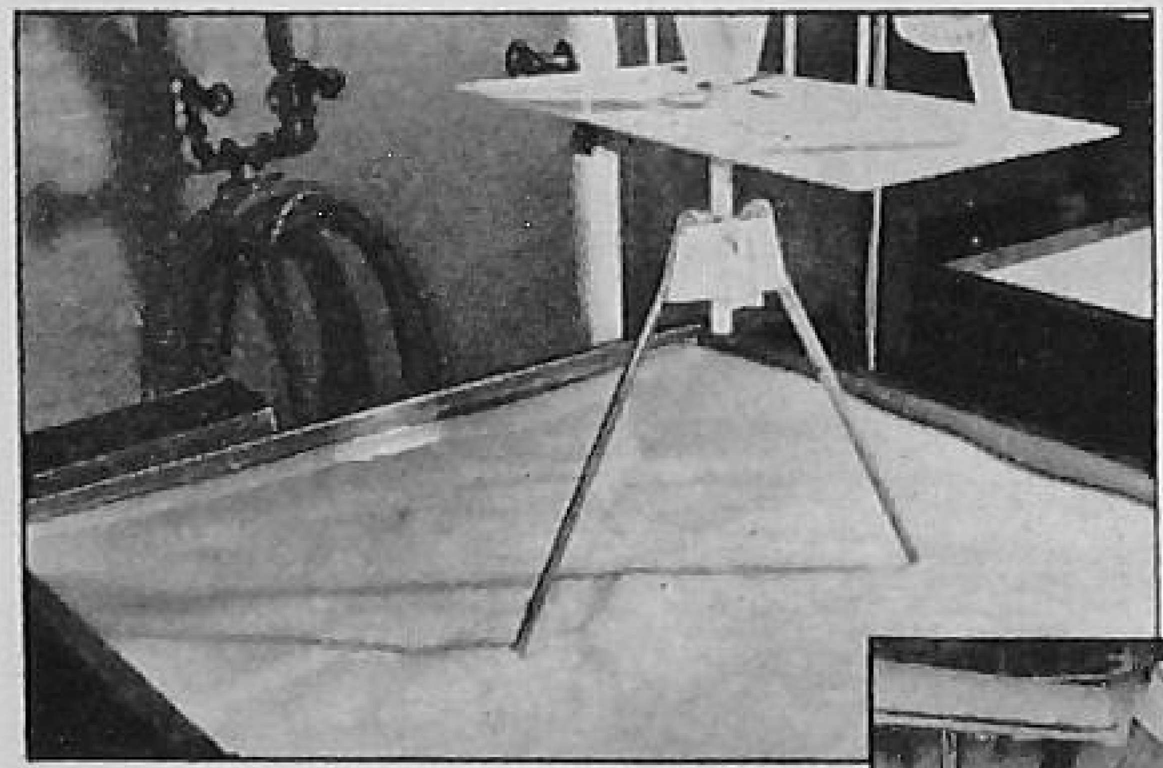
[1] *Agricultural Statistics 1953*, United States Department of Agriculture.



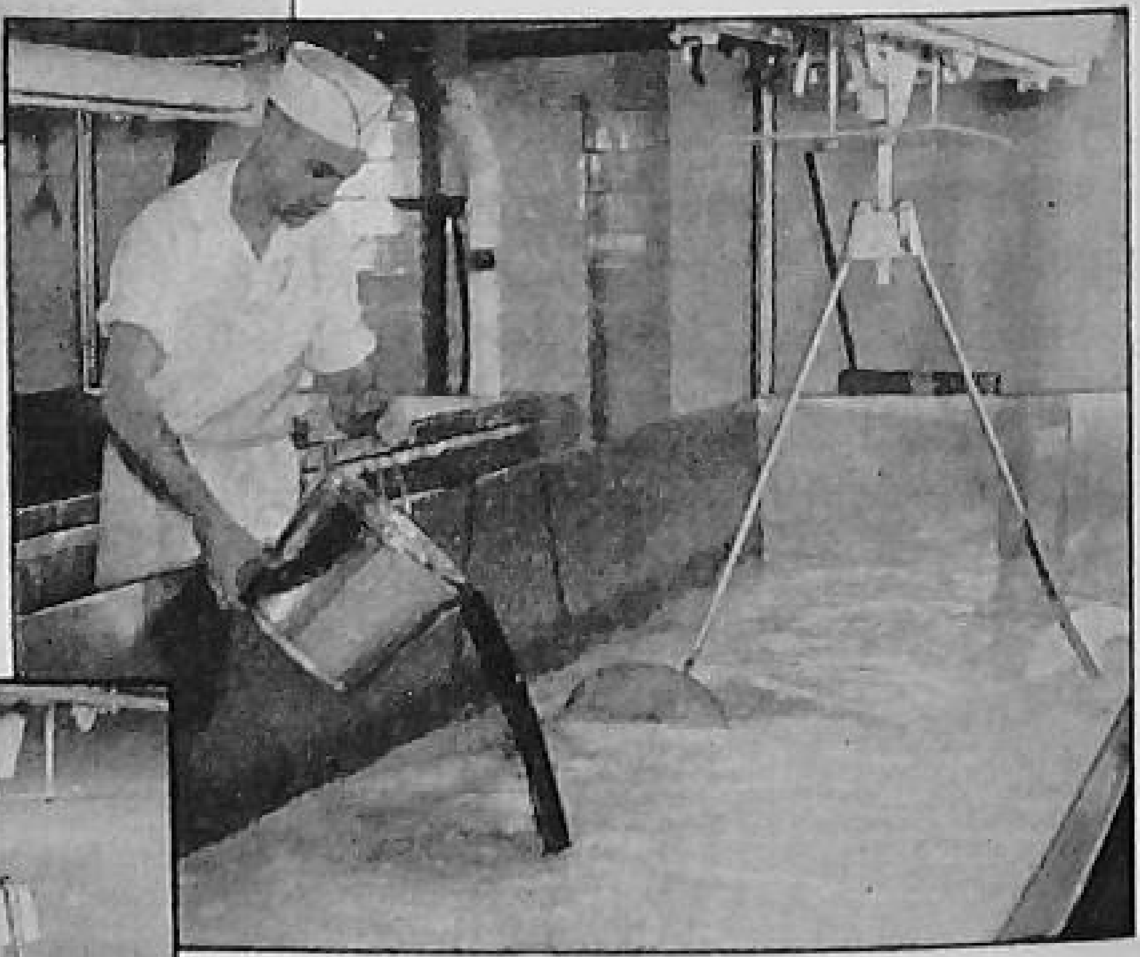
1. Protected milk collection



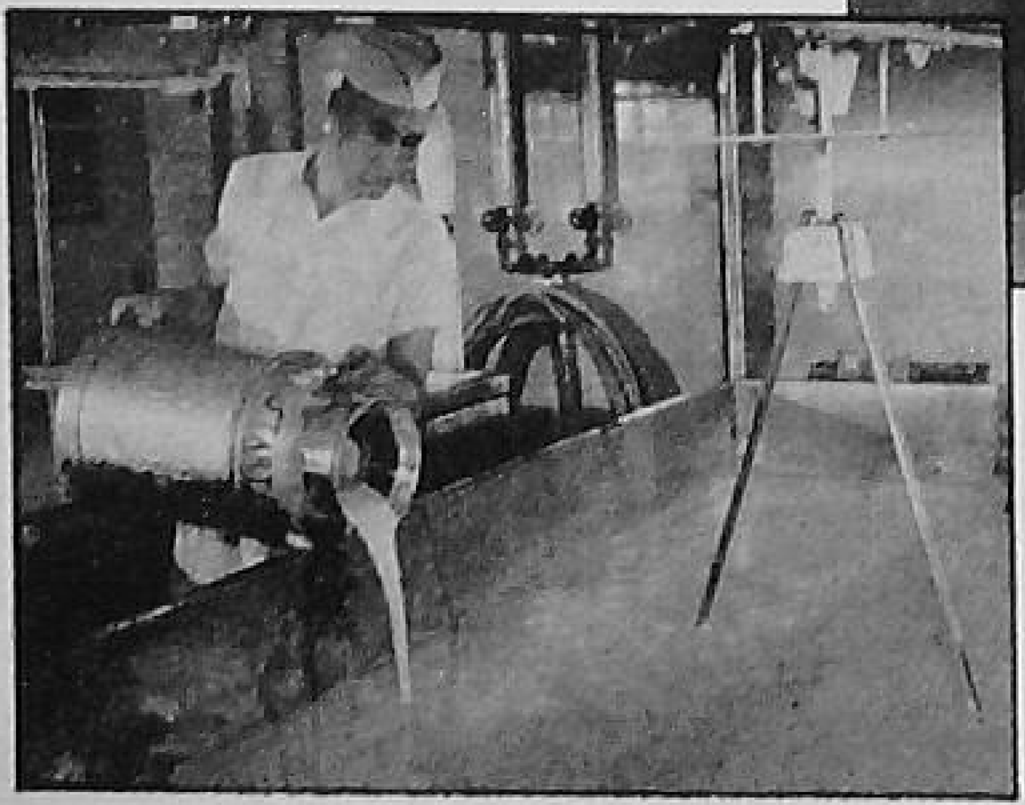
2. The milk starts its journey



3. The curd is heated



4. Rennet used to coagulate the milk

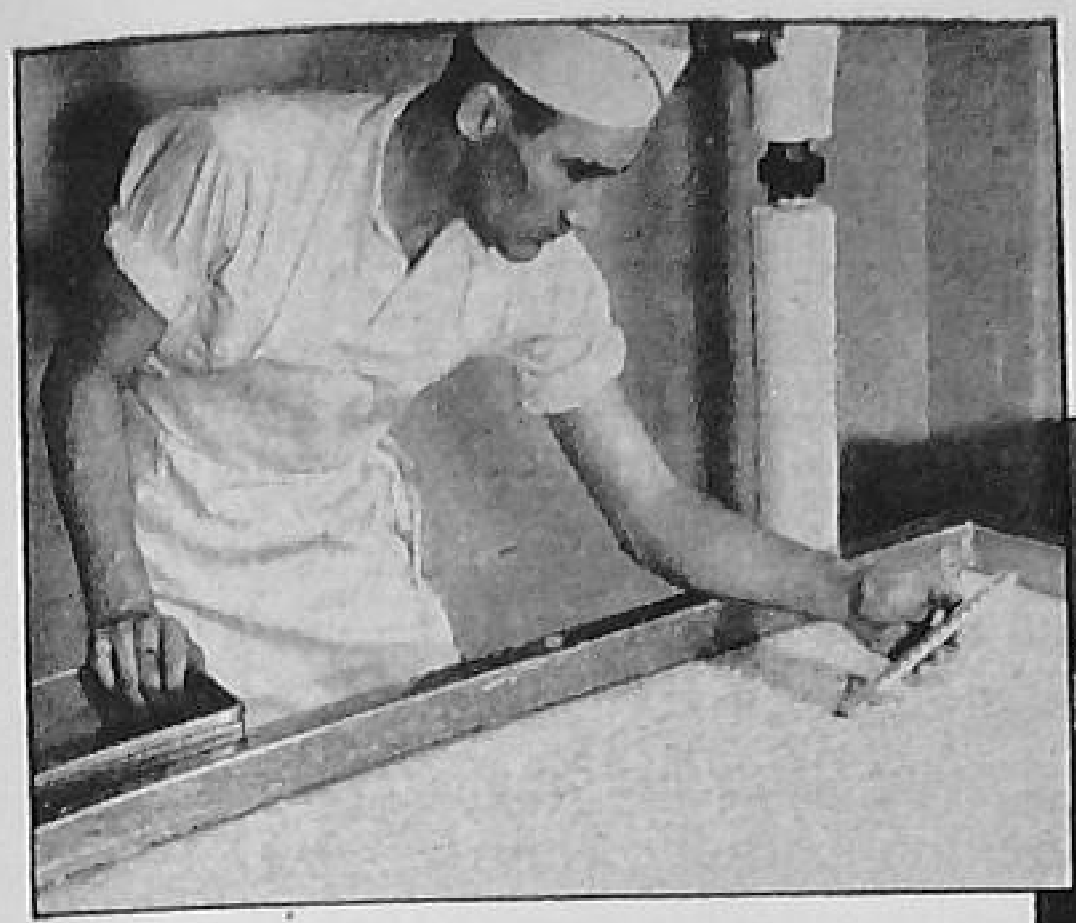


5. Starter curd added to the milk

Fig. 45

Cheddar cheese — from milk to shaped product

Courtesy of Kraft Foods Company



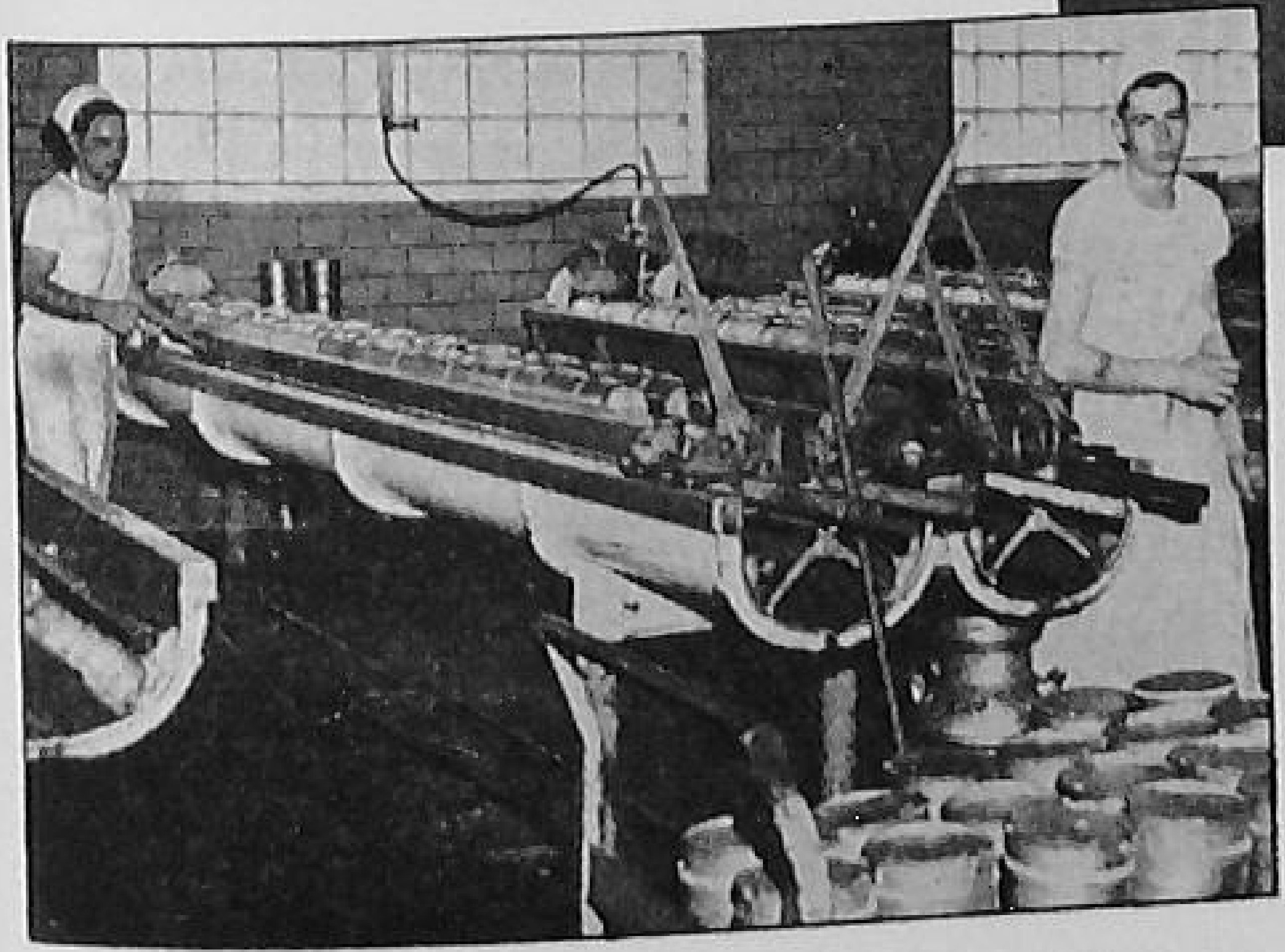
6. Every step is accurately controlled

7. The curd is matted

8. Milling the curd

9. Salting the curd

10. The cheese is pressed into shape



and the amount of moisture remaining in it. In Stilton, Roquefort, and Gorgonzola cheeses, which are well streaked with mold, it is quite evident that microorganisms, mainly mold, have played a major part in the ripening. In others, such as the American Cheddar cheese, no organisms are visible, yet the change in flavor and texture verifies their presence. Unripened Cheddar is mild and sweetish in flavor and tough and rubbery in texture. As the bacteria act upon it, a distinctive flavor develops, strong in proportion to the degree of ripening, and the cheese gradually mellows until, when well ripened, it will almost melt on the tongue.

As might be expected from its relation to milk, cheese is an excellent medium for the growth of microorganisms. This means that the manufacturers of cheese must use every precaution possible to prevent contamination with undesirable organisms which may mean spoilage and consequent loss. Thus in the modern cheese factory a high degree of sanitation prevails. Those organisms necessary for the production of a specific cheese are introduced, after which the cheese is stored under conditions that favor the development of the desired organisms.

To a large extent the designation of a cheese as either "soft" or "hard" is determined by the amount of moisture it contains. A soft ripened cheese contains as much as 50 per cent of water, and a soft unripened cheese may retain as much as 75 per cent. To form a hard cheese, the water may be extracted by the use of heat, pressure, or a combination of the two. The water content of hard cheese will ordinarily vary from 25 to 35 per cent.

Some cheese is made of skim milk, some of whole milk, and some of double cream, which is whole milk with the cream from a like quantity of milk added. Those containing butterfat in significant quantities are considered of highest quality and, as a rule, most desirable. The use of skim milk lowers the cost of production and in some instances is considered undesirable.

Process cheese — Cheese spreads

Differing somewhat from natural cheese is the pasteurized, process, or loaf cheese. This is reworked cheese made from one or more varieties. A common loaf cheese is made from a mixture of well-ripened and green Cheddar cheese. Other blends may include a mild Cheddar cheese to which are added portions of Limburger, Camembert, Roquefort, Swiss or any other desired cheese. The cheese is ground and heated. Often certain agents such as sodium acid phosphate, sodium citrate, sodium tartrate, potassium tartrate or mixtures of these are added to hasten the blending of the cheeses. The thoroughly combined mass is then packed in boxes or

forms lined with foil or plastic, holding from ¾ ounce to 3 pounds. Other products may be made by grinding Cheddar cheese of varying degrees of ripeness into a paste with butter or other cheeses with or without the addition of cream or milk solids. Many different materials are used for seasonings so that the number of these cheese spreads becomes almost unlimited.

The popularity of these products is due, in part at least to the blend of flavors which many people prefer to that of any one cheese and to the ease with which certain of these products may be combined with other foods and others may be used in sandwiches or as a spread. The small size of the package is undoubtedly an item also. Freedom from waste, such as the rind on regular cheeses, makes it seem a more economical purchase to many persons. This type of cheese tends to resist gas formation, fat leakage, mold development and foil discoloration better than natural cheese. It also deteriorates less rapidly at higher temperatures. It does not dry out before it is entirely used as does a larger cheese. However, successful packaging of portions of natural cheese in films which not only prevent drying but also resist mold growth minimizes some of the advantages once held by the processed product. There are many who consider the flavor of the natural cheese to be superior to that of the processed or reworked product.

Nutritive value

Cheese resembles milk in nutritive value. However, since a portion of the water is removed in the manufacturing process, it is a more highly concentrated food. American cheese is high in protein and fat and should be used in place of meat and eggs in the diet, not in addition to them. Compared with other common protein-rich foods, cheese is higher in fat, protein, ash, and calories, pound per pound, and is often less expensive.

The composition or nutritive value of cheeses varies. It is affected by the method of separating the curds from the whey, the degree to which the water is expressed, and the kind of milk from which the cheese is made. Cheese made by acid coagulation of the curd loses more calcium in the whey than do other types. The acid changes the calcium into a more soluble form, so that a greater portion remains in the whey. A cheese which has a high moisture content retains more of the soluble substances of the milk than does a hard, dry one.

Place in the diet. Cheese probably deserves much more extensive use in American diets than it now has, particularly on the low-cost levels, where the high quality of the protein would be valuable in supplementing that from plant sources. Perhaps its limited use is due largely to the fact that

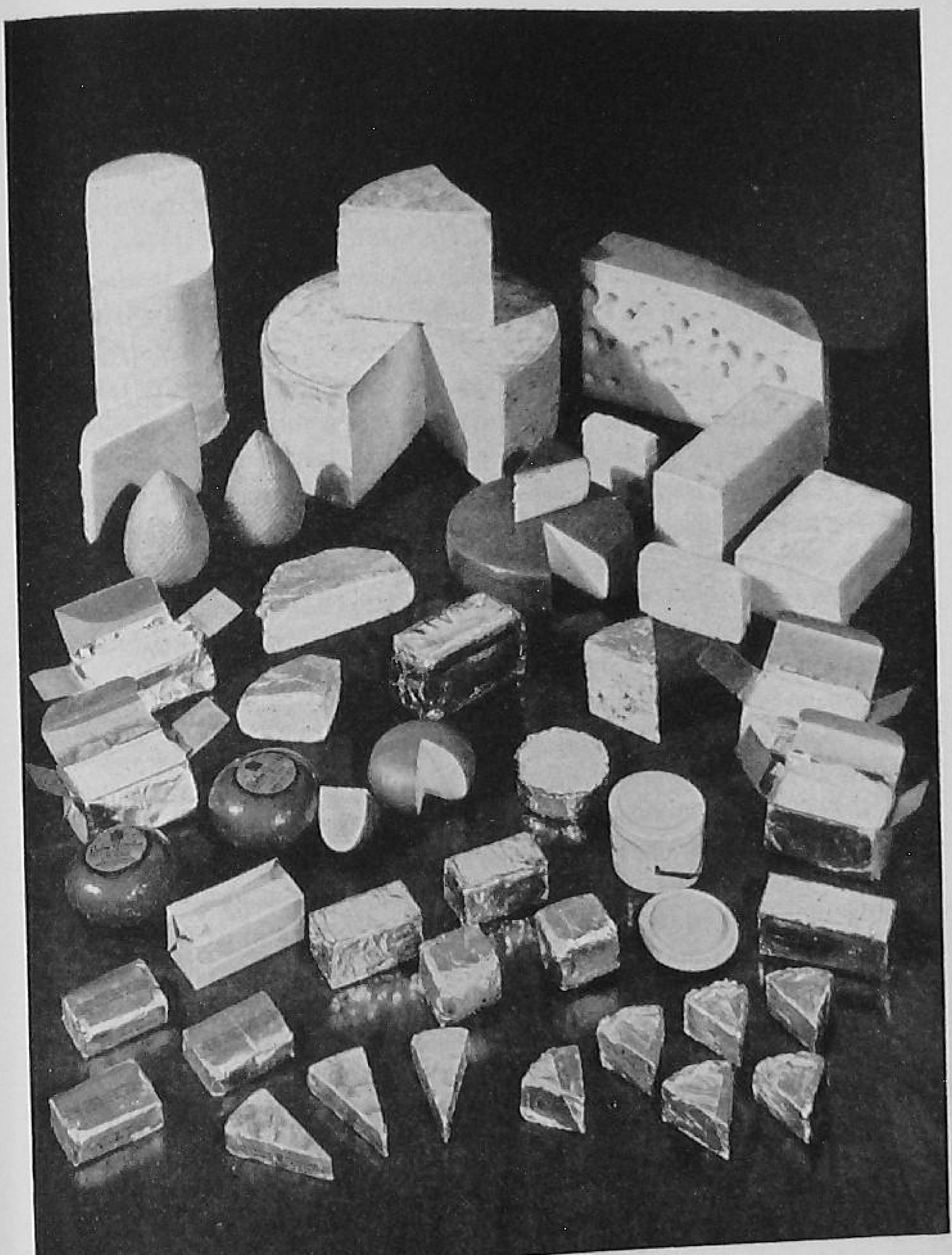
many people do not consider a meal complete unless meat is served, and thus cheese is often excluded. Then, too, the pronounced flavor of cheese causes it to be less generally acceptable than meat. Usually in every group of any size there is at least one person who will not eat cheese in any quantity, either because of its distinctive flavor or because it is thought to be indigestible. Lack of skill in planning meals to include a variety of palatable cheese dishes is also a factor.

The fact that cheese may occupy an important place in the diet is shown in the often mentioned case of the man who lived for a period of two years on a diet of cheese, bread, and fruit. During this time he consumed about one half pound of cheese daily. Throughout the period he maintained good health. Experiments show that cheese is a highly digestible food and is exceedingly well utilized by the body. The distress which sometimes follows the eating of cheese is probably due not to the cheese itself but to the character of the meal in which it is eaten. Any food consumed in excess, or after an already adequate meal, is likely to cause digestive disturbances. When cheese is served with pie at the close of a hearty meal, its so-called "indigestibility" needs no explanation.

Cheese in cookery

Like meat and eggs, cheese is relatively high in protein and fat, so yields a balanced diet only when combined with foods rich in carbohydrates. Because of its concentration, bulk should be supplied in the other foods; hence the suitability of the cheese, bread, and fruit diet previously mentioned. Combinations frequently made are cheese with potatoes, macaroni, spaghetti, rice, or bread crumbs. The generous use of crisp vegetables and fresh fruits in such a meal is always desirable.

Cheese may be served with crackers in place of some other dessert, with other ingredients in a salad, such as cottage cheese and pineapple, cream cheese balls with pears, American cheese with raw vegetables, or simply in slices for the main protein of the meal. Popular dishes containing cooked cheese are cheese soufflé, cheese fondue, Italian macaroni, Spanish rice, scalloped vegetables with cheese, fried cheese balls, toasted cheese sandwiches, rarebit, and many others. If cheese is served raw, it presents no problem of preparation at meal time. But in cooking, cheese offers certain difficulties. It is usually added to foods in a firm but finely divided form as grated cheese. As it is heated it softens and finally melts. As a rule a well-aged or ripened cheese blends more readily than an under-ripened or green cheese. Continued heating causes it to curdle, string, or become hard and tough, depending on whether moist or dry heat is applied.



Courtesy of National Dairy Council

Fig. 46

A variety of cheeses, such as are shown here, are found in most markets today.

Moreover, dry heat causes the cheese to smoke and give off a disagreeable odor due to its partial decomposition.

Sodium bicarbonate is often added to cheese dishes. It helps to disperse the cheese so that it mixes more completely with other foods. It is believed by some to render the cheese more digestible, but there is apparently no real foundation for this belief. It does neutralize the fatty acids of the cheese that are partially responsible for the flavor and thus it destroys some of the characteristic cheese taste.

Selection

The selection of a particular cheese is usually influenced by its flavor. Some prefer a well-ripened, highly flavored cheese, and others a milder one. The wide variety of cheeses on the market necessitates a degree of familiarity with them if one is to select wisely. Among the more or less common soft cheeses are Brie, Camembert, Neufchâtel, Limburger, Liederkranz, cottage, and cream. The rather common hard cheeses include Cheddar, Cheshire, Edam, Emmental, Parmesan, and Pineapple. A group belonging to neither of the above, called semi-hard cheeses, includes brick, Gorgonzola, Roquefort, and Stilton. Approximately 80 per cent of the cheese made in this country is the American Cheddar type and the average person uses American Cheddar cheese more than any other kind for food preparation. Other ripened cheeses are becoming increasingly important for the cheese course as well as for other purposes. For example, the service of a Roquefort cheese salad dressing, the use of grated hard Italian-type cheeses in soups and with spaghetti and macaroni, and the addition of Mozzarella cheese to Pizza pie are not uncommon.

Cream. Cream is an oil-in-water emulsion. It is actually the fat of milk dispersed in the milk serum. Constituents of milk other than fat are also present, but in entirely different proportions from those found in milk. Formerly cream was separated from the milk by gravitation. The milk was allowed to set in shallow containers, the cream slowly rose to the top and later was skimmed off. The resulting cream was often quite variable in its fat content. Today separation is accomplished by centrifugal separators adjusted so that cream of approximately the same fat content is obtained each time. Although many separators can be adjusted to yield cream with a 60 per cent or even a 70 per cent fat content, this is rarely done. On the retail market one usually finds only two classes of cream: thin, X, or "coffee cream," which ranges from 18 to about 20 per cent of fat; and thick, Double X, or "whipping cream," which contains from 35 to 40 per cent of fat.

Cream may or may not be pasteurized. From the hygienic point of view, pasteurized cream has the same advantages as pasteurized milk. Occasionally cream is homogenized; that is, it is forced through small openings at a pressure of about six hundred pounds per square inch. This results in a fine dispersion of the solids in the cream and particularly of the fat. The advantages of homogenized cream are that it does not "oil out" when added to coffee or other hot liquids and is much thicker than ordinary cream of the same fat content. However, homogenized cream seldom whips, probably due to the physical state of the protein and fat after homogenization.

Whipping

The whipping of cream greatly increases its use. Cream in its natural state is an emulsion, but when whipped, it is both an emulsion and a foam. The retention of the emulsion and the establishment of a foam in the cream are dependent upon several factors, the chief of which is viscosity, a quality which makes it resistant to pouring.

The viscosity of the cream varies with fat content, age, temperature, acid content, and previous treatment. Cream with a fat content of from 30 to 35 per cent is most satisfactory for whipping. If the fat content is below 30 per cent, the cream may whip quite readily, and the volume will perhaps be greater when first whipped than that of cream with a higher fat content; but upon standing, the foam tends to resolve somewhat and the volume decreases. A fat content of more than 35 per cent offers no advantages in whipping, and if too high may result in a "buttery" consistency. Cream thickens with age and whips best when 24 to 72 hours old although, if cold, it may whip 2 or 3 hours after separation or pasteurization. A low temperature also increases the viscosity of the cream. A temperature of 7° C. (45° F.) or less is desirable. At about this temperature the butterfat in the cream hardens, a factor essential in the establishment of a stable foam. The cream curdles more readily at higher temperatures, and at 18° or 20° C. (65° or 68° F.) it is impossible to obtain a good whip. The acidity has little effect on the whipping quality of the cream until the acid content is so great as to give it a definitely sour taste. Pasteurization of cream, if properly done, interferes only slightly with the whipping process, but homogenization and boiling are both detrimental to it. Homogenization disperses the fat into such fine particles that the formation of a foam is difficult and affects the protein so that it does not stabilize any foam which is formed. In somewhat the same manner, boiling disperses the fat clumps. It also coagulates part of the protein.

The addition of various substances is frequently recommended as improving the whipping quality of cream. Chief among these is viscogen, a solution of sucrate of lime. This is used with varying degrees of success.

The shape and size of the container in which the cream is beaten, as well as the efficiency of the beater, affect both the volume obtained and the time required for beating. Cream with a fat content of 30 or 35 per cent, if properly whipped and kept cold, can be held for several days without slumping or "separating out."

Cream in cookery

Both sweet and sour cream are frequently used as a seasoning for vegetables, in sauces, and similar dishes. It is also used as both shortening and liquid in cakes, biscuits, muffins, and similar flour mixtures. Although the quantity of sour cream used is small as compared to the sweet, now that commercial sour cream of high quality is widely available its use as a seasoning is increasing. Cream, because of its emulsified form, is especially suited to such use and frequently gives products of superior quality, particularly in flavor. Cream also exerts a definite effect upon the texture of such sugar mixtures as fudge and upon frozen desserts, tending to make them more creamy.

Butter. Butter, the fat held in highest esteem for table use as well as for many seasoning purposes, is the fat of milk. It is separated from cream by churning or mechanical agitation.

The making of butter from pasteurized cream is growing in favor. After pasteurization the cream is ripened. During this process an acid fermentation usually occurs. This is generally considered to improve the odor and flavor of the butter and also to make the cream more easily churned. Churning is actually the agitation of the cream so that the fat globules stick together in masses which may be separated from the buttermilk. The butter, freed of the buttermilk, is washed in pure water, and usually salted. It is worked to distribute the salt evenly and to remove some of the water which remains in the butter.

Although butter is generally made from sour cream it may be made from sweet. Butter is valued especially for its characteristic flavor and color although its food value, at least in respect to vitamins, is superior to that of other non-enriched fats.

Eggs

It is a matter of little wonder that eggs are of great importance to all peoples. The fertile fresh egg, apparently inanimate, after a short period of incubation — only twenty-one days — yields a fully developed chick. An unlearned or superstitious people would see in this metamorphosis the working of some supernatural force and would regard eggs as emblematic of some wondrous event.

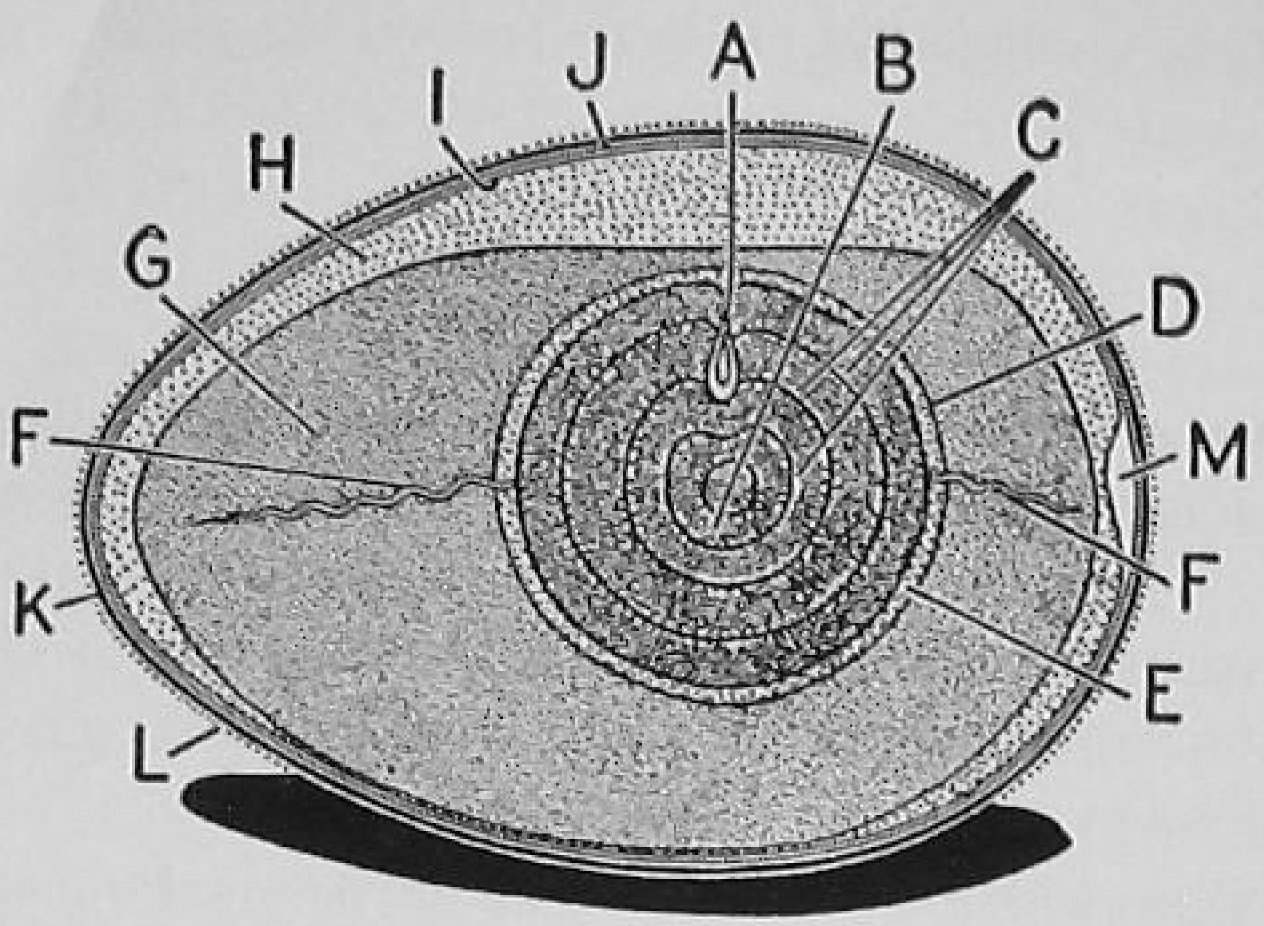
Eggs have been regarded since earliest time as symbolic of good fortune by the peoples of many lands. To many primitive people eggs signify the return of life following the winter season. Hence among certain tribes in Africa and South America offerings of eggs are made to the idols at the spring festivals. To the Egyptians, eggs signified the restoration of mankind after the deluge; the Jews see in them the symbol of happy deliverance from bondage, and use them in the Passover feast, celebrating their departure from Egypt; the Hindus hold eggs to be the source of all life and refrain from eating them. The use of eggs in celebrating Easter by the people of Christian lands is no doubt a tradition handed down from earlier festivities.

Structure

The egg is composed of the shell, two rather thick membranes directly within the shell, the white, a thin membrane separating the white from the yolk, the yolk, and the germ spot.

The shell is porous, allowing an exchange of moisture and gases, which although of value to the developing embryo, decreases the keeping quality of the egg. To prevent excessive loss of moisture through the shell, a kind of mucus is deposited on it by the time the egg is laid. This is a thin film which tends to seal the pores and thus also to protect the contents of the egg from contamination. This film is the "bloom" often spoken of as characteristic of fresh eggs. However, the "bloom" no longer necessarily signifies a fresh egg, since many fresh eggs are dipped in a suitable oil or otherwise treated to seal the pores. Moreover, it is comparatively simple to produce the "bloom" by artificial methods. In addition to protecting the contents, the shell is a source of calcium for the young chick during incubation.

The shell varies from brown to white. No relationship necessarily



Courtesy of Institute of American Poultry Industries

Fig. 47

The egg is composed of thirteen readily recognized parts. *A.* germ; *B.* yolk; *C.* layers of fat; *D.I.J.* membranes; *E.H.* thin albumin; *F.F.* yolk anchors or chalazae; *G.* thick albumin; *K.* shell; *L.* mucus or bloom; *M.* air cell.

exists between the color of the shell and the food value and quality of the eggs. In spite of this fact, a decided preference for eggs of one color or another is found in certain communities.

Between the shell and the egg white is a double membrane, one the inner-shell membrane or container for the white and yolk, and the other the outer-shell membrane. As the egg cools immediately after it is laid, the inner-shell membrane contracts, leaving an air space in the large end between the two membranes. This is sometimes referred to as "the chick's first breath."

Within the inner-shell membrane and surrounding the yolk is the egg white. The fresh egg contains both thick and thin white. The thin white is in two layers, one just within the membrane and the other between the rather large mass of thick white and the very dense layer immediately surrounding the yolk.

The yolk with the germ spot is held within a membrane known as the *vitellin* membrane. The germ spot is present in both the fertile and the infertile egg. It appears as a spot of lighter color on the upper side of the yolk. Infertile eggs deteriorate less rapidly than do fertile eggs, even when not kept at refrigerator temperatures. For this reason many of the finest market eggs are infertile.

Attached to the vitellin membrane and prolonged at either end as cords is a dense layer of white. These cords are called yolk anchors or chalazae.

One purpose of the chalazae seems to be to hold the yolk as near the center of the egg as possible. When the white liquefies, as it does under certain conditions, the yolk anchors or chalazae have no anchorage, and the yolk rises to the uppermost side of the egg. A second function of the chalazae seems to be to allow the yolk to revolve with relation to the egg as a whole so that the germ spot always remains uppermost. This is possible because of the peculiar nature of the chalazae and the presence of larger fat globules on the side of the yolk containing the germ spot. These provisions insure that the embryonic chick, being next to the warm body of the hen during brooding, will have the uniform heat necessary for its development.

Composition

The most obvious parts of an egg are designated as the white, the yolk, and the shell. In general, the egg is 57 per cent white, 32 per cent yolk, and 11 per cent shell. This proportion varies considerably, one investigator noting that the more nearly round the egg, the higher the proportion of white, and another that small eggs have a higher proportion of white to yolk than large ones. Eggs are about three fourths water, containing an average of 74.0 per cent. In this respect the yolk and the white vary greatly. The yolk is only about one half (49.4 per cent) water, but the white averages 87.8 per cent. Obviously the yolk is a more concentrated food than the white. The yolk, made up of about one third fat and fatlike substances in an emulsified form, also contains a greater proportion of minerals and vitamins than the white. The proteins of egg white are ovalbumin, ovoglobulin and ovomucin, the principal one being ovalbumin. The protein in the yolk is mainly ovovitellin. The distribution of important food constituents in the egg is shown in Table 31.

Eggs contain ovoflavin and carotinoid pigments. The ovoflavin gives the slightly greenish tint to the white, and the carotinoids are responsible for the yellow color of the yolk. The food of the hen directly influences the color of the yolk, green feed and yellow corn increasing the yellow color.

Nutritive value

The egg is considered a valuable source of protein. It is relatively high in this substance, the whole egg averaging 12.8 per cent. The proteins are complete or adequate, hence they are capable of supporting growth and are also valuable in supplementing such incomplete proteins as those from cereals.

Since the minerals required for the body tissue of the young chick are present in the egg, it is reasonable to conclude that those necessary for the

TABLE 31. COMPOSITION OF WHOLE EGG, EGG YOLK, AND EGG WHITE *

	Whole Egg Per cent	Egg Yolk Per cent	Egg White Per cent
Water	74.0	49.4	87.8
Protein	12.8	16.3	10.8
Fat	11.5	31.9	0.0
Ash	1.0	1.7	0.6
Calcium	0.054	0.147	0.006
Iron	0.0027	0.0072	0.0002

* Chatfield and Adams, **Proximate Composition of American Food Materials**, United States Department of Agriculture Circular 549, 1940.

building of tissues of the human body are likewise present. This is true of the minerals commonly studied, although a large proportion of the calcium is found in the shell and is, as the egg is now used for food, not available to the human being, though utilized by the developing chick. Experimental work has shown that the iron of the egg is valuable in increasing the hemoglobin of human blood. The presence of a comparatively large amount of sulfur accounts for the excess of acid-forming over base-forming elements found in eggs.

In their vitamin A value, egg yolks resemble butter and are an excellent source. Some writers rank egg yolks second after fish oils as a source of vitamin D. Thus, much emphasis is placed upon egg yolks because of their potency in these fat-soluble vitamins. However, their vitamin A and D content is apparently not constant. The amount of the former is dependent upon the ration of the hen, and that of the latter varies with her ration and her exposure to sunlight. Eggs are a good source of riboflavin, a fair source of thiamine and contain a trace of niacin. They are deficient in ascorbic acid.

Keeping quality

The quality of the freshly laid egg, as indicated by such characteristics as the ratio of thick to thin egg white and by the strength of the yolk membrane, varies. This variation is due probably to feed, season of the year, period in the laying cycle, and the individual characteristics of the hen. The high water content together with the protein makes eggs susceptible to spoilage. The shell offers considerable protection against contamination. Particularly is this true of the egg produced under clean,

sanitary conditions. However, an egg which is laid out-of-doors on a warm drizzly day and later kept in a warm room, spoils quickly. The rain opens the pores of the shell and thus permits the loss of moisture and carbon dioxide and the absorption of odors. The loss of moisture causes the air cell in the egg to increase in size, and the loss of carbon dioxide results in a definite increase in alkalinity. With increased alkalinity, deterioration occurs rapidly if the egg is held at a high temperature. As it ages, the jelly-like portion of the white becomes more liquid, changing to a "watery white," probably due to slight self-digestion. The yolk is more concentrated than the white, hence some of the water from the white gradually passes by osmosis through the semipermeable vitellin membrane into the yolk. The yolk as a result gradually flattens as the membrane stretches. If the process goes far enough, the membrane may break when the egg is opened. The change may be rapid or gradual, depending largely on the temperature at which the egg is kept. Consequently, the quality of an egg is much more closely related to method of handling than to age as measured in days.

Factors that largely determine the retention of the quality of an egg are, in approximately the order of their importance: the temperature and the conditions of humidity and ventilation under which it is kept; the absence of undesirable odors; the condition of the shell; the presence of carbon dioxide in the atmosphere, and the absence of bacterial or mold contamination.

Preservation

All conditions which tend to prevent changes in eggs increase their keeping quality. Storing eggs in waterglass, a chemical, sodium silicate which closed the pores of the shell and thus promoted their keeping quality was once a recommended practice in order that more eggs might be available in the seasons when few eggs were being produced. Today holding eggs at relatively low temperatures is the most important method of preventing change whether in the home or in commercial storage. A carefully controlled temperature ranging between −1° and 0° C. (31° and 32° F.) delays spoilage. In addition to a correct storage temperature, proper conditions of humidity and ventilation are essential. Storage in an atmosphere of carbon dioxide is believed to have a practical application as yet not fully developed. In addition to storing the eggs in a room in an atmosphere of carbon dioxide, attempts are being made to package eggs in a film in which carbon dioxide is enclosed. Coating the shell to prevent the exchange of moisture, gases, microorganisms and odors has been

practiced for some time. Plastic films have been used but probably the most practical treatment at present is dipping the eggs in an odorless, flavorless vegetable or refined mineral oil. The oil may be cold or may be heated to 93° to 127° C. (200° to 260° F.). The warm oil expands the egg, drives out the air, and slightly toughens the shell membrane. Eggs so treated are known as "processed," "shell-treated," "sealed," or "sterilized." High frequency irradiation is being tried in an attempt to extend the keeping quality of shell eggs and perhaps eliminate the need for refrigeration.

At one time it was estimated that about 12 per cent of the eggs produced in this country were stored commercially as shell eggs. Although it might appear at first that so small a percentage would not be significant, storage of eggs has a highly desirable stabilizing effect on prices. About half the year's total is produced during March, April, May, and June. If it were not for storage, eggs would be so cheap during these months as to be unprofitable to the producer, and at other seasons so expensive as to be prohibitive to many people. Cold storage was for many years the principal method of preserving eggs in large quantities. This method of storing eggs is perhaps of less importance now than formerly because of the large quantity of eggs preserved by freezing and by drying. From three to four hundred million pounds are frozen annually. In 1950 this was approximately 5.7 per cent of the total egg production.[1]

In preparation for freezing, the eggs are broken singly, and the yolks and whites separated or mixed together depending on the product being prepared. They are put in clean cans or containers having a capacity of thirty pounds or more. They are then frozen in sharp freezers and held at low temperatures until time for use. Freezing has little effect upon the white, although certain investigators believe the frozen whites whip slightly better than fresh whites of similar quality. The yolks are altered by freezing, becoming stiff and gummy. To prevent this, a small amount of salt, sugar, glycerin, or some other edible substance is added before freezing. Frozen yolks are used commercially in the making of mayonnaise, confections of various kinds, noodles, and by bakeries in a variety of products. In freezing eggs, strict supervision of sanitary conditions is necessary. The eggs are exposed to possible contamination upon removal from the shell. It is important also that only eggs of high interior quality be used, as even one inferior egg may result in an undesirable product. Experimental work indicates that there is no increase in bacterial count in

[1] *Technology in Food Marketing*, Agricultural Monograph No. 14, United States Department of Agriculture.

frozen eggs held for one year or even, in some instances, two and a half years; neither is there complete destruction of bacteria. For this reason many workers recommended the pasteurization of the liquid egg before freezing. There is apparently not complete agreement as to the effect of pasteurization upon the cooking quality of the egg, but it seems to be not too detrimental.

Dried whole egg, dried egg yolk and dried egg white are available commercially. Dried egg products should be prepared under the same strict sanitary conditions as frozen eggs. During the drying period 90 per cent or more of the water is removed so that one pound of dried whole egg is equal to thirty-six to forty average sized eggs. Whole egg and egg white have the glucose removed either by fermentation or by enzymatic action prior to drying. Removal of the glucose retards the development of an obnoxious flavor and the browning reaction in dried whole eggs. Removal of the glucose seems to be of value in producing a white which will whip and also one with good keeping quality. Whole egg and egg yolk are dried principally by the spray method. In spray drying the liquid egg is forced under pressure into a heated chamber. The spray dries quickly and is collected in the lower part of the chamber. Some damage is done to the egg by drying. The addition of sucrose tends to prevent this. Sugar-dried-egg may contain from 20 to 30 per cent sucrose and is extensively used. Egg white from which the glucose has been removed is dried on trays, drums, or belts in cabinets or drying tunnels or is spray dried. Apparently there are still problems involved in the spray drying of whites. Dehydrated egg products keep best when dried to a low moisture content and packed in an inert gas as nitrogen.

Cookery qualities and functions

Eggs are highly nutritious and are frequently served as the main dish in the meal. They also have a variety of uses in cookery. They perform at least seven different cookery functions: thickening, leavening, emulsifying, binding, coating, clarifying, coloring, and flavoring. These functions are due to various qualities of the egg, but most of them arise in the fact that the protein of eggs, which is largely albumin and globulin, coagulates under heat.

The beaten whole egg begins to coagulate at about 65° C. (149° F.) but continues to thicken until a temperature of about 70° C. (158° F.) is reached. The yolk thickens at about the same temperature, and as a rule is not thickened too much to flow until a temperature of 70° C. (158° F.) is reached. The undiluted egg white thickens at a lower temperature, begin-

ning at about 60° C. (140° F.). Thickening may continue to 64° or 65° C. (147° to 149° F.). These temperatures are for the undiluted egg heated slowly to the temperatures indicated. Such factors as temperature and time, and the presence of other substances such as liquids, sugar, and salts of various kinds, all affect coagulation.

When the egg coagulates, it first forms a clot which may be thought of as a series of strands interlaced to form a network. Encased within this network is the liquid. The amount of liquid may be small, as in the case of a cooked egg, or large, as in scrambled eggs or custards. As heat is applied, first a homogeneous mass forms. If heating is continued, the network contracts, tending to force out the enclosed liquid and leaving a proportionately dry, tough solid. If the amount of liquid present is small, as in the hard-cooked egg, no liquid separates, but when liquid has been added, overcooking will cause it to be expressed and a curdled mixture results. Coagulation occurs more rapidly and the coagulum tends to be more firm at increased temperatures. When the egg is diluted, as in making custards, the temperature of coagulation is higher and the resulting coagulum is more tender. One egg thickens a cup of milk only slightly, the thickening occurring at about 80° C. (176° F.). If sugar is added the coagulation temperature may be raised. This increase may be about 3° C. (5.4° F.) for the quantity of sugar ordinarily used in custards. The addition of sugar also raises the temperature at which curdling occurs. The presence of small amounts of acid hastens coagulation. A custard containing small amounts of acid may be firmer than one which is almost neutral. However, any appreciable acidity, such as that obtained when an acid fruit is added to a custard or when the milk is slightly sour, results in the curdling of the custard. In such sauces as salad dressing in which eggs, water, and lemon juice or vinegar are cooked together, those sauces with more acid give a thicker dressing. For some reason those made with vinegar show a greater tendency to curdle than those containing lemon juice.

The effectiveness of the egg as a leavening agent is dependent upon the amount of air beaten in and retained during the process of food preparation. The white of the egg is more frequently used for this purpose than either the yolk or the whole egg. The preference for the white is due to its capacity for forming a stable foam, thus introducing air into the product to be leavened. When heat is applied the air bubbles expand, the egg white stretches and then "sets" or coagulates, thus giving a light porous structure to the product.

Among the factors thought to exert an influence upon the whipping or

foam-forming quality of eggs are individual characteristics, age, previous treatment, temperature when whipped, addition of other substances and type of equipment used for beating. Apparently no two eggs whip exactly the same. The age of the egg and the treatment it has received may have considerable influence upon the thickness or thinness of the white. This is generally considered to be an important factor. Thin whites often beat to a larger volume, giving a foam that is lighter and less pasty than that from the highly viscous whites but also less stable.

Under certain conditions of storage, the egg whites tend to become thin rather rapidly. Hence, possibly, came the association of the age of an egg with its whipping quality. Eggs at room temperature whip much more quickly than those at refrigerator temperature and yield a larger volume. Eggs at 20° C. (68° F.) give a good volume and a more stable foam than eggs at a higher temperature. Salt is frequently suggested as aiding in the whipping of eggs. It seems probable that the salt causes a slight stiffening of the protein and is of value in that manner. The addition of acids, especially tartaric acid and its acid salts, gives a more stable foam.

The shape of the bowl affects the ease of whipping egg whites and also the type and volume of foam produced. A bowl with a small, rounding bottom, sloping out to a wider top, is generally considered best. The type of beater is also thought to affect the nature of the beaten egg white. With a given amount of beating, a rotary beater often yields a finer foam that is somewhat more stable than that produced by a whip. Beaters with thin wires or with thin blades tend to give a finer foam. Much of the early work with the whipping quality of egg whites was done with hand beaters. Today when efficient power beaters are available, the results may be somewhat different. The greater ease with which thin whites whip may not be as apparent when power beaters are used. The ease with which thin whites may be overbeaten becomes increasingly evident, thus the degree of whipping which is most desirable should be considered. When egg whites are beaten until dry, the foam has lost some of the elasticity that is desirable for leavening. If they are beaten a little beyond this point, small white specks appear. This is believed to be coagulated protein. When this occurs, the egg white has the minimum leavening power. The presence of sugar apparently retards the rate of coagulation or denaturation. This is evident in the making of meringues, sponge cakes, and similar egg dishes.

Fat, whether it be from yolk, milk, or other source, interferes with the whipping of the egg white, and if present in any measurable quantity may prevent whipping entirely. One drop of yolk will reduce the volume of whipped egg white to less than one third of that otherwise obtained.

The yolk is seldom used as a leavening agent. If beaten long enough, however, it will produce a foam which is usually fine and is much smaller in volume than would be obtained from a like quantity of white. When the yolk and sugar are beaten together, as in making a sponge cake, the sugar makes a syrup and helps to give viscosity and thus extensibility.

The value of eggs as an emulsifying agent [1] depends on their ability to form thin stable films around tiny globules of oil. Use is made of this quality in making mayonnaise. Egg yolk, itself a stable emulsion, is a more efficient agent than whole egg. Whole egg, in turn, is more efficient than egg white. It is well known that oil and water will not mix with any degree of permanency. With the addition of egg yolks, the two may be mixed and will remain in an emulsified state.

The texture of cakes containing fat is greatly improved by the addition of eggs. This is probably in part due to their emulsifying property, although to some extent the eggs may act as leavening agents. Eggs also serve as binding agents, tending to give tenacity or continuous body to certain foods such as cream puffs and popovers, allowing them to stretch and expand but at the same time retain the leavening so that the finished product is light and well formed.

Eggs form a coating on food and hold the crumbs, flour, or meal in place, thus assisting in the formation of a crust and in browning fried foods.

The use of eggs for clarifying foods such as broths and jellies is dependent upon their property of coagulation. As the egg coagulates, it encloses within its meshes any foreign particles present in the liquid, thus facilitating their removal.

Little need be said concerning the use of eggs for flavoring and coloring. There is a seemingly well-founded idea that desserts, sauces, and similar dishes are more palatable when thickened at least in part with eggs. Similarly, many persons prefer ice cream and other frozen desserts which contain eggs.

The yolks of eggs sometimes develop a dark greenish color on the surface. This is especially true when the eggs are cooked in the shell and allowed to cool slowly in the cooking water. This color is believed to be due to ferrous sulfide formed by a combination of the iron of the yolk and the sulfur of the white. Every homemaker is familiar with the darkening of silver when in contact with egg. This is attributed to the formation of silver sulfide.

Because of the characteristics of the egg that make it important in cookery it is not surprising that eggs are extensively used. The average

[1] See the discussion of emulsions, note 1, page 176.

yearly per capita consumption of eggs in 1952 was 36 per cent higher than in 1935–39.[1] Preliminary estimates placed the civilian consumption of eggs in 1954 at 410 eggs per person, 3 per cent higher than in 1953 and a record.[2]

PROBLEM 7 *How shall eggs be prepared?*

Eggs are occasionally prepared and served uncooked as in eggnogs and frozen desserts, but for the most part they are cooked. Cooking eggs changes their consistency and flavor and renders them much more palatable, increasing their acceptability as a food. Research workers have found that egg whites were slightly better utilized when cooked than when raw, and also that soft-cooked eggs leave the stomach a little more quickly than hard-cooked eggs. It also appears that fried eggs are digested as readily as those prepared by other methods. From the standpoint of rate of digestion, there seems to be no reason why uncooked eggs should be served.

Favorite ways of cooking eggs are in the shell, poached, baked, fried, in omelets, both French and puffy, and scrambled. Certain facts apply to the preparation of eggs by any method:

1. The albumin of eggs is soluble in pure water.
2. The albumin, globulin, and ovovitellin are soluble in dilute salt water.
3. Eggs are coagulated by heat.
4. Eggs cooked slowly at low temperatures tend to be more tender.
5. High temperatures toughen the coagulated protein of eggs.
6. Overcooking, even at low temperatures, results in a tough, dry egg dish.
7. When liquid is added to the eggs, overcooking causes the liquid to be expressed and a curdled mixture results.

Because egg white thickens at about 65° C. (149° F.) and egg yolk at about 70° C. (158° F.), a somewhat higher temperature must be used if the egg is cooked in the shell. Even if the egg is held in water at a given temperature for a long period of time, the temperature at the center of the egg

[1] *Proceedings of National Food and Nutrition Institute*, Agriculture Handbook No. 56, United States Department of Agriculture.

[2] *The National Food Situation*, NFS-68, Bureau of Agricultural Economics, United States Department of Agriculture, April, 1954.

may not reach that of the water. Eggs held in water at 70° C. (158° F.) do not become as firm as do eggs cooked at a higher temperature. The white is jelly-like and the yolk, although it no longer flows, has still the color of the uncooked yolk. Cooking an egg in boiling water will give a yolk with a dull yellow color and, as a rule, a white which is toughened. Temperatures between 70° C. (158° F.) and 100° C. (212° F.) give results between the two described. Eggs cooked at about 85° to 90° C. (185° to 194° F.), or a simmering temperature, are usually preferred. At this temperature about thirty minutes are required to cook the egg "hard." The hard-cooked egg so prepared has a firm but tender white and a firm but not rubbery yolk, and there is no discoloration at the juncture of the white and the yolk. The time required for cooking varies not only with the temperature of the cooking water, but also with the initial temperature of the egg, the proportion of water to eggs, and the uniformity with which the temperature is maintained.

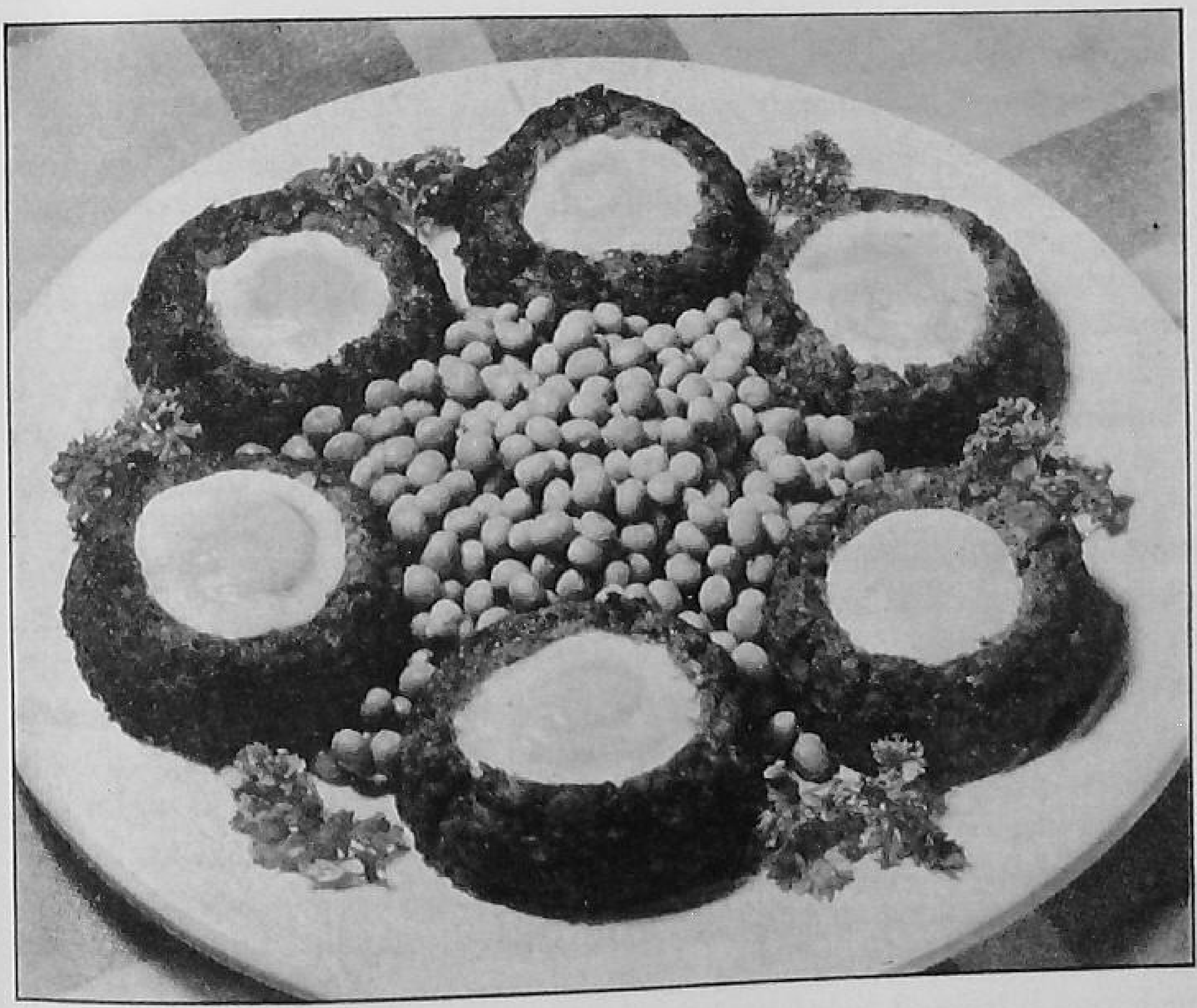
Cooking eggs in hot water

The chief consideration in the cookery of eggs in the shell is the maintenance of a suitable cooking temperature for the desired length of time. Poached eggs are more difficult to prepare. As certain constituents of the egg are soluble in cold or lukewarm water, the egg may lose its shape through its tendency to break up. The breaking up is more apparent in eggs with thin whites than in those with thick, viscid ones. Accepted standards for poached eggs require that the product be compact and firm, neat in shape, and neither hard nor tough. To prepare a poached egg successfully, hot water should be used. The surface of the egg is then coagulated immediately, and the interior is protected against the solvent action of the water. Poached eggs usually retain their shape more satisfactorily if the poaching liquid is deep enough to cover the egg entirely and if it is stirred before the egg is dropped in. The egg is dropped into the vortex that is formed by the swirling of the liquid. Often salt, vinegar, or lemon juice is added to the water in which the egg is poached, or tomato juice is used as the poaching medium. The acid apparently accelerates the coagulation of the egg proteins. Although these substances are considered especially valuable by some when poaching eggs with thin whites, this is questioned by others. Eggs poached in salt water, under certain conditions at least, present a dull, somewhat porous appearance. The addition of a small quantity of acid to the water (one teaspoon of vinegar or lemon juice to a quart of water) has no undesirable effect upon the flavor of the egg and aids in keeping the white tender. A colorless acid tends to prevent the

egg white from turning yellow. The use of milk as the liquid for poaching results in a product of slightly different flavor and nature and one of increased food value if the milk is served with the egg.

Baked eggs

Baked eggs offer no problem in the retention of shape. They are placed either in individual baking dishes or in one larger baking dish with seasonings and usually crumbs, and a liquid or sauce added. The crumbs not only brown and add to the attractiveness of the dish but also act somewhat as an insulator, protecting the eggs from the direct heat of the oven. Not enough liquid is added to affect the shape of the eggs. The liquid moistens the crumbs and adds flavor. It may be milk, cream, meat stock, or a sauce such as tomato sauce.



Courtesy of Swift and Co.

Fig. 48

Eggs baked in hash nest make a substantial main dish for breakfast, luncheon, or supper.

Fried eggs

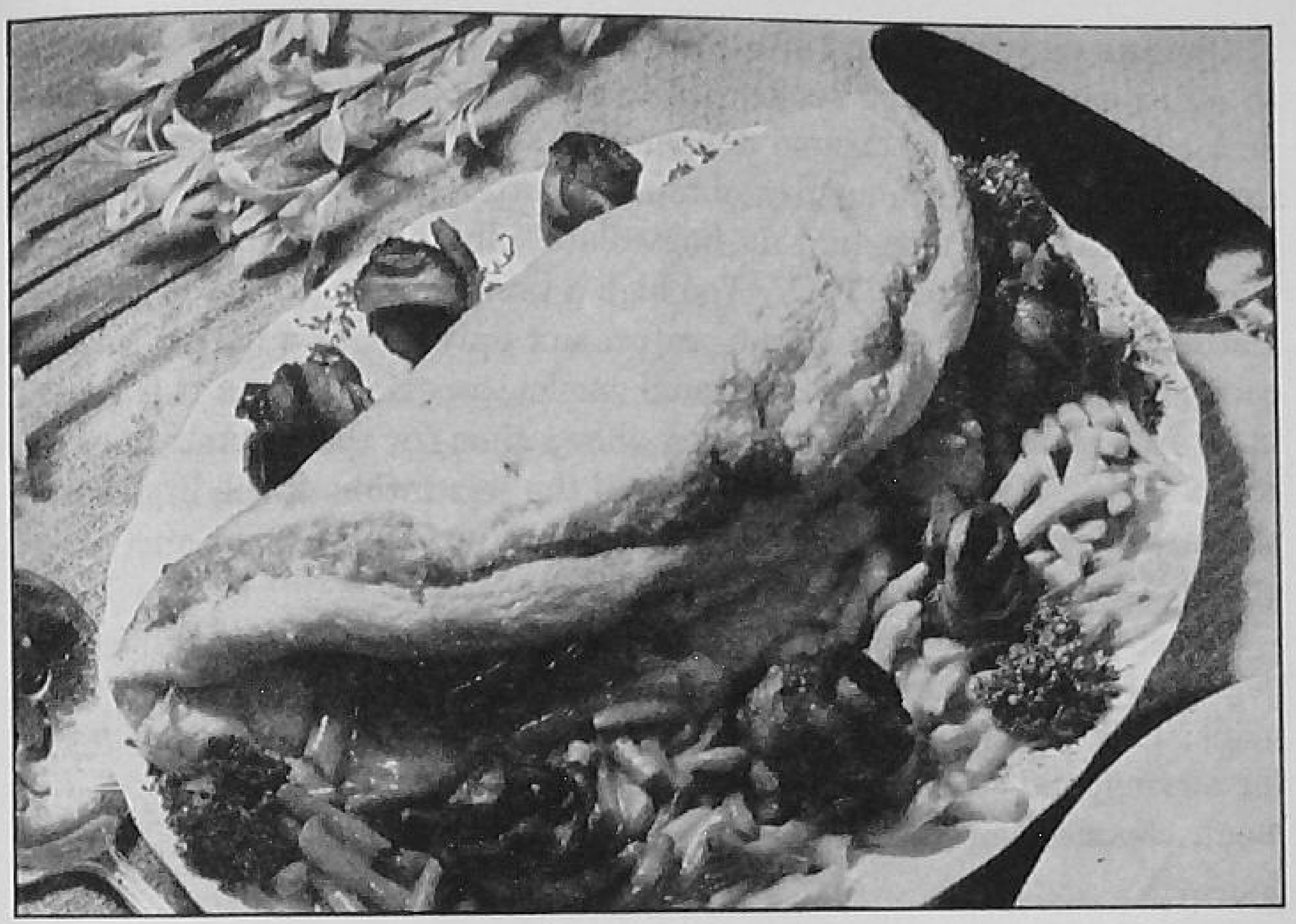
Fried eggs are especially esteemed as a breakfast dish in many families. Eggs may be fried in butter or in a fat lacking in flavor, but more frequently they are fried in ham or bacon fat, which adds its own characteristic flavor. Fried eggs are best when added to fat hot enough to cause them to set within a few seconds but not so hot as to brown and toughen them. The top of the egg may be cooked by dipping a little hot fat over it, or by covering the utensil. A small amount of water may be added to the hot fat and the utensil covered. The steam thus formed aids in cooking the egg. The egg, to be attractive in form for serving, must be placed in the skillet or other utensil so as to be round and compact; and it must not be broken or torn in the process of removal.

Omelets

Omelets may be either plain or puffy. An omelet-like dish may contain, in addition to the eggs and seasonings, tapioca, bread crumbs, rice, or white sauce. The latter are less delicate than the true omelets, which contain no thickening agents.

Plain or French omelets are made by beating the eggs and seasonings together until they are mixed and then cooking them slowly, pricking the mixture occasionally, until it is "set." Puffy omelets are more complicated. They are light and fluffy as the name indicates, and may easily be four times as large as a plain one using the same ingredients. The characteristics of the omelet are dependent largely upon the ingredients and the method of mixing. For a puffy omelet, the yolks and whites are separated. The usual directions state that the seasonings should be added to the egg yolk, but they may be added to the whites. Liquid is not necessary in making a puffy omelet, but its use gives a larger and more tender product, as a rule. One tablespoon of liquid to an egg is usually recommended. More than this quantity is likely to make the omelet so tender that the air cells collapse during cooking. The liquid used largely determines whether it shall be added to the yolks or the whites. If water or a fruit or vegetable juice is the liquid added, it may well be beaten in with the egg whites. The other seasonings are also added to the whites. The yolks may be added, without beating if desired. Tomato and lemon juice are the juices most often used. Quantities recommended are one teaspoon of lemon juice and two teaspoons of water or one tablespoon of tomato juice per egg. When these acid juices are added, the resulting omelet is larger in volume and more tender than one made with water.

Milk or cream is sometimes used rather than water. These add to the



Courtesy of Swift and Co.

Fig. 49

Puffy omelets, such as the one shown here, require care and skill in the making.

food value and perhaps to the flavor, though they make it more difficult to obtain a light, fluffy product. When one of these liquids is used it must be added to the yolk. If it is added to the white, the fat content of the milk or cream prevents whipping. Even small amounts of fat interfere with foam formation in the egg white. The omelet containing milk or cream is usually smaller than that made with water. The stability of the whipped egg foam is important in determining the quality of the puffy omelet. Thick whites as a rule give a more stable foam and hence tend to give an omelet of higher quality. In the preparation of a puffy omelet, the whites are beaten until stiff enough to stay in an inverted bowl, and the yolks, if beaten, until they are thick and lemon-colored. Addition of seasonings or flavorings and liquids are made as desired. The yolks are added to the stiffly beaten whites and mixed carefully but thoroughly. Incomplete mixing usually results in separation of the yolk to form a solid layer at the bottom of the omelet. Too much mixing may result in breaking down of the air cells in the foam, giving a heavy, compact product. The omelet should be cooked as soon as mixed, otherwise the liquid settles out and results in a heavy layer.

Omelets may be cooked either in the oven or on top of the stove. As in other methods of egg cookery, a moderate temperature is best. It is easier to maintain the desired temperature in oven cookery, hence the inexperienced person frequently obtains a better product if the omelet is poured into the hot pan and set immediately in an oven heated to a temperature of 350° F. or 177° C. Too high a temperature results in a tough, leathery product; too low a temperature not only means a longer time for cooking but may produce a discolored omelet, especially when it is cooked in an iron skillet. The slow cooking allows time for the formation of ferrous sulfide. There is also probability of the separation of the liquid from the mass, leaving a compact layer on the bottom and a foam on top; or, on the other hand, the omelet may fall.

The standard omelet is light, puffy, delicately browned, and tender, the degree of the first two points depending upon the kind of omelet being made. It is well seasoned and palatable. It is ordinarily rolled or folded for serving, and often foods of various kinds such as grated cheese, ground meat, creamed vegetables, or fruit are rolled inside.

Scrambled eggs

Scrambled eggs are much like French or plain omelets except that the mixture is stirred while cooking over a slow heat. The resulting product is somewhat irregular in shape, although its consistency should be smooth and uniform. As in omelets, the addition of a small amount of liquid gives a more tender product. If a larger amount of liquid is added, overcooking of the eggs in an effort to secure thickening will result in a curdled mixture, due to separation of the liquid. If cooked in an iron skillet, the eggs may show traces of ferrous sulfide. The standard product consists of loose, tender "rolls" of egg with no white showing.

Variations and service

From these more or less basic methods of egg cookery, many variations are possible. Hard-cooked eggs are often peeled, sliced, and combined with white sauce to make creamed eggs. They are sometimes peeled, stuffed, and served either hot or cold. The addition of various foods such as cheese, bacon, ham, fruit, and vegetables as flavorings gives variety to otherwise plain egg dishes.

The promptness with which eggs are served adds vastly to their acceptability. No matter how carefully a puffy omelet has been prepared, it shrinks on standing. A fried egg, if not served immediately, becomes grease-coated, cold, and unpalatable. The quality of cooked eggs is in-

jured more by standing than is that of many other foods. Eggs should be served as soon as prepared unless, like stuffed eggs, they are to be served cold.

ACTIVITIES

1. Hard-cook an egg in boiling water and another in water from 85° to 90° C. (180° to 190° F.). Compare for tenderness.
2. Each student prepare a puffy omelet.
3. Prepare various egg dishes, selecting from among the following:
   - Bacon and eggs
   - Baked eggs in tomatoes
   - Baked eggs with asparagus tips
   - Coral eggs on toast
   - Eggs à la goldenrod
   - Eggs à la Manhattan
   - Eggs baked in cheese sauce
   - Eggs baked in tomato sauce
   - Egg croquettes
   - Eggs in cases
   - Eggs poached in milk
   - Eggs poached in tomato sauce
   - Egg timbales with cheese sauce
   - French omelet served with sauce soubise
   - Hot stuffed eggs
   - Mushroom omelet
   - Scalloped eggs
   - Scrambled eggs and bacon
   - Scrambled eggs with dried beef
   - Scrambled eggs with ham
   - Spanish omelet
4. Compare and score the finished products.
5. Estimate the cost of each product prepared.

Refer to *Practical Cookery*, "Eggs," pp. 29–34; Heseltine and Dow, *The Basic Cook Book*, "Eggs," pp. 332–341.

Recipes for products selected not included in these references are to be supplied by the instructor.

PROBLEM 8 *How shall custards and related dishes be prepared?*

Because of their high food value and their acceptable flavor and color, eggs are perhaps more used as thickening agents for desserts and sauces than are any other foods. It is generally considered that a dessert or sauce thickened with eggs is richer and more delicate and palatable than one thickened with other agents. Although extensively used alone for thickening, eggs are also frequently used in combination with starchy agents. Particularly is this true when eggs are high in price.

Of the common dishes thickened with eggs, custards are among the most popular. Custards are really milk and egg mixtures, sweetened, flavored, and cooked until thick. The consistency of the cooked custard is dependent upon the proportion of eggs to milk. The product desired may be thick enough to hold its shape or thin enough to pour freely, but in either case it should be a smooth, homogeneous mass.

The method of cooking a custard greatly affects the finished product. The same ingredients and the same proportions result in quite different products by different methods of cooking. The soft custards, often called "stirred custards," are cooked over hot water and are stirred constantly while cooking. They do not set to form a gel and even when quite thick may be poured from the container. The firm or "baked custard" is cooked without stirring. Although frequently baked, it may be steamed. The finished product is a delicate jelly which may or may not hold its shape if turned from the baking dish.

Uses

Custards are simple, nutritious, and, as a rule, inexpensive. They are commonly used as a dessert. The custard may be served alone or it may be "dressed up" by a garnish of whipped cream or by serving with a sauce. The soft custards may be garnished with meringue poached in hot water and dotted with tiny cubes of jelly or bits of colored fruits. Nuts or shredded coconut may also be used.

Soft custards may be served as sauces over fresh or canned fruit, cake,

gelatin desserts, and a variety of puddings. They add to the appearance as well as the flavor and food value of a dish.

Custards often form the foundation for less simple dishes. Many salad dressings, frozen desserts, and sauces have a custard basis.

Ingredients

The proportions of ingredients may be varied successfully within certain limits. A common custard recipe uses two to four tablespoons of sugar and from one to four eggs to one cup of milk. A custard that is to be served alone as a dessert will perhaps need to be sweeter than one that is to be used as a sauce over cake. If a soft, delicate, "firm custard" or a thin, "soft custard" is desired, one egg to a cup of milk is sufficient. One and one half or two eggs to a cup of milk will make a firm custard that can be turned from individual molds. These proportions are satisfactory for custard pie also. The larger amounts of eggs should be used only when making large custards that are to be unmolded, or custards that are to be cut in fancy shapes to be used as garnishes.

Egg yolks or egg whites may be substituted for whole eggs. Two egg yolks are approximately equivalent to one egg in thickening power and give a smoother product and richer flavor under the same conditions, perhaps due to the fat content. Two egg whites thicken about as much as one whole egg. They tend to give a foamy mixture, add no color, and are seldom used. Custards made with egg whites coagulate or thicken at a lower temperature than custards made with whole eggs. Although strictly speaking a custard is thickened only with eggs, one tablespoon of flour is often substituted for one egg in making a three- or four-egg custard without too great a sacrifice of flavor and texture.

Many common desserts are made with a custard foundation in which a starchy thickening agent has been substituted for part of the egg content. This is true of bread pudding, rice custard pudding, tapioca cream, and many similar products.

The ingredients used in both custards and sauces are, for the most part, simple and few in number. Nevertheless, care is required in combining the ingredients and in the cookery.

Cookery

The most commonly used method for making custards is to scald the milk before combining it with the other ingredients. This saves time only when more than one cup of milk is used. When one cup of milk or less is being used, the cold egg and the utensil containing it cool the milk so much

as to cancel the saving in time. It is sometimes held that the custard made from scalded milk is less likely to curdle than that which is made from milk not scalded. Scalding may lead to the detection of slight sourness which might otherwise go unnoticed. The egg is beaten until completely mixed, but no more, since too much beating makes a custard porous. Then salt and sugar are added. The hot milk is poured gradually in the egg mixture, which is stirred constantly to avoid uneven cooking. Note that the egg mixture is not added to the hot milk, since the probability of uneven cooking would be greatly increased by this procedure. If a firm custard is being prepared, the flavoring is then added.

The soft custards are cooked over hot, not boiling, water. They are done when the custard coats the spoon and the foam disappears from the top of the mixture. As soon as this stage is reached, they should be removed from over the hot water and set in cold water to stop the cooking. When slightly cool, the custard should be flavored.

Baked custards are cooked in an oiled dish set in a pan of hot water. The oven in which they are baked should be of a moderate temperature (177° C. or 350° F.), one low enough so that the water surrounding the dish does not boil. The custard is done when the tip of a small pointed knife carefully inserted comes out clean. This type of custard also should be removed from the heat as soon as done, lest it curdle due to overcooking.

Steamed custards are cooked in custard cups in a steamer. The cups are covered with waxed paper to keep out moisture, and the custards are steamed until firm. They should be tested in the same manner as baked custards.

Temperature may be used to ascertain when custards are done. Generally speaking, custards begin to thicken or coagulate at 80° C. (176° F.) although this varies with the proportion of ingredients used. An increased proportion of eggs lowers the coagulation point; increased sugar or milk raises it. The substitution of egg yolks for whole eggs raises the coagulation point, whereas a similar substitution of egg whites lowers it. It has been found that when custards are made with one egg, one cup of milk, and one tablespoon of sugar, the optimum coagulation temperature is 82.5° C. (180° F.) and that curdling occurs at 83.5° C. (182° F.) When two egg yolks are substituted for the egg, the other ingredients being unchanged, the optimum coagulation temperature is 83.5° C. (182° F.) When two egg whites are substituted for the egg, the optimum coagulation temperature is 82° C. (179.6° F.). Changes in the rate of cooking cause these temperatures to vary slightly. When the mixture is heated rapidly the maximum thickening may not occur until temperatures of 87° or 88° C. (189° or

190° F.) or even 90° C. (194° F.) are reached, and then curdling may follow almost instantly. For this reason, it is better to cook custards rather slowly, especially as the temperature approaches the coagulation point. Otherwise a smooth, even product is difficult to obtain.

Sauces thickened with eggs may vary a few degrees in the temperature of the thickening point from that suggested for custards because of the different ingredients contained, but the principles of cookery are the same. Precautions must be taken against overcooking and consequent curdling whether milk, water, or an acid is used as the liquid. A curdled product, whether used as sauce or as a salad dressing, is not only uninviting itself, but it also detracts from the food on which it is served.

If uncooked starchy agents, such as tapioca, are used to replace part of the egg content, special precautions in cooking are necessary. The starch must be thoroughly cooked, yet the egg must not be overcooked. This difficulty is best met by cooking the mixture of milk, seasonings, and starchy agent until the starch is thoroughly cooked and then adding the hot mixture to the beaten egg gradually while stirring, and continuing the cooking only until the egg is thickened. Overcooking, even when a starchy agent is included, may cause curdling. Hence bread pudding, rice custard, and similar desserts cooked in the oven must be set in a pan of hot water and cooked slowly if the product is to be satisfactory.

ACTIVITIES

1. Prepare a custard, selecting from among the following:
   - Baked custard
   - Custard for sauce to serve over cake, fruit, or whips
   - Soft custard to serve alone or as floating island
   - Flavor custard with nutmeg, vanilla, chocolate, or caramel syrup as desired.
2. Prepare a dessert thickened with eggs and a starchy thickening agent, selecting from among the following:
   - Butterscotch tapioca cream
   - Caramel tapioca cream
   - Chocolate bread pudding
   - Chocolate coconut bread pudding
   - Chocolate tapioca cream
   - Coconut bread pudding
   - Orange bread pudding
   - Queen of puddings
   - Rice custard pudding
   - Tapioca cream
3. Score and compare the finished products.

Refer to *Practical Cookery*, "Desserts," pp. 160–165 and Heseltine and Dow, *The Basic Cook Book*, "Desserts," especially pp. 510–545.

Recipes for products selected not included in these references are to be supplied by the instructor.

PROBLEM 9 *How shall soufflés and similar dishes be prepared?*

A great variety of protein-rich dishes that serve as main dishes for luncheons and suppers and occasionally for breakfasts offer special problems of preparation. The same general rules regarding the effect of heat in egg cookery apply to the cookery of other protein-rich dishes. In the preparation of a soufflé, a fondue, macaroni and cheese, and other dishes high in protein, the cooking temperature will largely determine the quality of the finished product.

A soufflé is a combination of a thick white sauce, egg yolks, and usually some added material such as grated cheese or chopped ham made light and fluffy by stiffly beaten egg whites and then baked or steamed. It is delicate, palatable, and attractive. Frequently, left-over foods are used in their preparation, so that they are inexpensive. A mixture of fruit pulp or fruit pulp and juice, sugar, and stiffly beaten egg whites, when baked, is also referred to as a soufflé.

In some respects a fondue resembles a soufflé. The chief difference is the nature of the starchy thickening agent used. The best known fondue is a preparation of eggs, butter, and cheese, with the addition of milk and bread or bread crumbs. Both resemble a puffy omelet in that they are somewhat light and fluffy. However, the starchy agents give more body; so they are less delicate than true puffy omelets.

Combining the ingredients and cooking

A smooth, properly thickened white sauce is essential for a good soufflé. The yolks and the whites are beaten separately as in making a puffy omelet. The egg yolks and the chopped food are added to the white sauce after it has cooled slightly. These ingredients are mixed thoroughly, then the stiffly beaten egg whites are added. The egg whites are folded

Courtesy of Armour and Co.

Fig. 50

A spinach soufflé, as well as all other soufflés, may be tested for doneness by inserting a sharp pointed knife.

in gently but thoroughly, the lightness of the baked product depending largely upon the amount of air incorporated with the egg whites. The mixture is then placed in a baking dish set in a pan of hot water and baked in a moderate oven (177° C. or 350° F.). The water acts as a protection to the soufflé and tends to prevent overcooking. If the dish is unoiled, the soufflé clings to the sides and a slightly larger volume is obtained.

Soufflés are done when a sharp pointed knife inserted into the center comes out clean. Overcooking toughens the product and may result in curdling. Undercooking will result in excessive shrinkage when taken from the oven. Although the soufflé shrinks some, even when thoroughly baked, it does so rather slowly when first removed from the heat. As a rule, a small baking dish results in less shrinkage than a larger one.

Fondues offer much the same problem of preparation as do soufflés, although no white sauce is used. Instead the milk and bread crumbs are

mixed and the cheese and seasonings are added. The egg yolks are then combined with the mixture, and finally the beaten whites are folded in. Fondues are cooked and tested for doneness in the same manner as soufflés.

In preparing macaroni with cheese, potatoes with cheese, and other dishes which combine starchy foods with cheese, the cheese is added in a solid form. The problem is one of melting and blending the cheese with other foods. The cheese is added either grated or cut into small pieces. This facilitates melting and blending.

Cheese blends more readily with foods that have some body or thickness. For example, it combines more smoothly with a white sauce than with milk. Spaghetti, macaroni, and similar starchy foods tend to aid in blending the cheese. Cheese curdles, strings, hardens, or toughens when subjected to direct heat or to high temperatures. Consequently cheese dishes are usually prepared in a moderate oven (177° C. or 350° F.), or over hot water. The starchy food aids in protecting the cheese against the direct heat of the oven. A rather general practice is to cover the surface with buttered bread crumbs.

ACTIVITIES

Prepare a soufflé or other protein dish, selecting from among the following:

- Apricot soufflé with custard sauce
- Carrot soufflé
- Cheese and corn soufflé
- Cheese fondue
- Cheese soufflé
- Chocolate soufflé
- Cheese custard
- Date soufflé with butterscotch sauce
- Egg soufflé
- Ham cornmeal soufflé
- Hot banana soufflé
- Italian macaroni
- Lemon soufflé
- Macaroni and cheese
- Meat soufflé
- Nut soufflé
- Peanut soufflé
- Potato soufflé
- Potato volcano
- Prune soufflé with custard sauce

Salmon soufflé
Spinach soufflé
Tomato cheese soufflé

Refer to *Practical Cookery*, pp. 103–106 and other pages listed in index under "Soufflés"; Heseltine and Dow, *The Basic Cook Book*, pages listed in index under "Soufflés."

Recipes for products selected not included in these references are to be supplied by the instructor.

Meat, Poultry, and Fish

In the prehistoric days of the cave dweller, man's diet was composed predominantly of meat. From the nature of the bones found in the débris of discovered caves it appears that bear, rhinoceros, mammoth, and horse alike fell by the hunter's skill and doubtless served to furnish his food. In ancient though relatively more recent times, the yearnings of the tribes of Israel for the "fleshpots" of Egypt record a continuance of the esteem in which meat was held. A scrutiny of the food listed as served at dinner in medieval England shows that these meals were comprised preponderantly of meat and fish, sometimes as many as five or six different meat dishes being served. The English monks of the fifteenth century subsisted on "simple rations" including a pound and a half of meat daily, in addition to the fish and oysters that might be provided. The dietary practices in the American colonies reflected those of the mother country. The abundance of deer, bear, buffalo, and turkey from the wilderness enabled the early settlers to remain meat-eaters. With the growth of the colonies, there came the introduction and planned production of cattle and hogs to meet the demand for meat of a growing population.

The extension of the boundaries of the country westward brought in the prairie section, suited for cattle range. The cattle raising industry flourished in "border states" including Kansas, Colorado, and Texas. In time the settlement of the country greatly restricted the free range. This, with the growing body of scientific data concerning feeding, changed the character of the cattle raising industry from that dominated by the picturesque cowboy to one largely under the sway of "weighed rations of known nutritive value." The increased interest in animal nutrition and

the use of antibiotics has led to drastic though perhaps less dramatic changes in the methods of growing pork and poultry also. Beef, pork and chicken are popular foods in America. Preliminary estimates of the average civilian per capita consumption of meat products for 1953 set a forty-five-year record rate and were as follows: beef 76.7 pounds, veal 9.5 pounds, lamb and mutton 4.7 pounds and pork (excluding lard) 62.9. In addition to this we consumed an average of 10.8 pounds of fish, 23.1 pounds of chicken (eviscerated) and 4.4 pounds of turkey — a total of approximately 192 pounds of meat products.[1] It is estimated that in 1952 more than 23,035 million pounds of fresh meat were produced in the United States, and more than 3835 million pounds were cured. Of the fresh meat produced, less than 3 per cent was lamb and mutton.[2]

Certain characteristics of the individual meats are at least partially responsible for the differences in the amounts consumed. Beef is the flesh of mature cattle. Its flavor, texture, cost, and the wide variety of uses for which it is suited contribute to its extensive use. Between beef and veal, as far as age and degree of development are concerned, are baby beef and calves. There is a growing preference for younger beef because of the decreased cost of production and the smaller carcass, from which smaller roasts and steaks may be cut. However, the younger animals do not have the more developed flavor of the mature beef; hence there is a definite demand for a certain amount of mature beef.

Veal is the flesh of young cattle, usually not more than twelve weeks of age at the time of slaughter. It is mild in flavor and requires rather careful preparation to produce a dish of high quality. It is found on the market in limited quantities. Pork, the flesh of hogs, is generally available and extensively used. More cured pork is used than fresh, although the loins and frequently the shoulders are used fresh. The keeping qualities of cured pork doubtless account for its wide use. "Lamb" designates young sheep and is usually limited to animals under fourteen months of age. Mutton carcasses are from sheep more than a year old. Lamb and mutton have a characteristic flavor that is delicious to many but considered objectionable by some. This characteristic flavor is no doubt a factor in determining the amount consumed. However, the widespread belief that lamb and mutton are suited only to certain seasons of the year, and the lack of knowledge on the part of the homemaker of the variety of cuts, are undoubtedly important limiting factors. Actually little mutton is found on

[1] *National Food Situation*, NFS-68, Bureau of Agricultural Economics, United States Department of Agriculture, April, 1954.

[2] *Agricultural Statistics 1953*, United States Department of Agriculture.

the market in this country. Most of the ovine animals are sold as lamb.

Improved practices in the production and marketing of poultry have no doubt contributed to an increased consumption. The estimated consumption in 1953 was 23.1 pounds per capita and it was only 13.9 pounds in 1940.[1] Characteristic flavor and texture as well as the great variety of ways in which it may be served also tend to make poultry meat popular.

Structure

The muscle tissue, which largely comprises the meat of any animal, is made up of bundles of muscle fibers. These are surrounded by connective tissue which attaches the fibers to one another. Each muscle fiber is a sort of tube that encloses a large part of the flavoring and food value of the muscle. Water, protein, fat-like substances, salts, and other constituents are found in the fibers. Fat is intermingled with the muscle fibers as well as with the connective tissue and is deposited in layers around the muscle. The amount of fat depends largely upon the "finish"[2] of the animal and is also affected by its age. The presence of fat is desirable, for it is generally associated with more tender meat. That deposited in the connective tissue which results in the flesh being well marbled is especially prized. Fat increases the palatability of the meat and aids in retaining moisture in the muscle during cooking.

The connective tissue, which surrounds the muscle fibers and holds them together, is of two main kinds, white and yellow. The white connective tissue, of which the tendons are largely composed, is nonelastic and serves to bind the muscle fibers to each other and the muscles to the bony structure. It is largely collagen and is changed by moist heat to gelatin. The yellow connective tissue, which is extremely elastic, is found where both strength and elasticity are required, as in the ligaments, between the muscle fibers, and in the walls of the blood vessels. It is largely elastin and is less affected by moist heat. Connective tissue is thicker and more developed in the much used muscles; hence, those in the neck and the legs have more connective tissue and are less tender than the less used muscles such as those along the back. The toughness of the connective tissue is dependent, not only upon the proportion of elastin to collagen, but also upon the

[1] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

[2] "Finish" is the term applied to the amount and distribution of fat in the carcass. A desirable finish results when there is a smooth, even covering of brittle fat over the external surface of the carcass and a thinner, even covering over the inner surface of the ribs. Too much fat is undesirable, but a certain amount is necessary to insure "marbling" or intermingling of fat in the muscle.

thickness of the tissue and possibly upon the age of the animal. The effect of age is especially noticeable in poultry, the young as a rule being much more tender than the older.

Nutritive value

Meat is an excellent source of high quality proteins, suitable to meet the needs of the body. Meat contains practically no carbohydrate, and the amount of fat varies greatly. Meat contributes valuable minerals, being especially high in iron and phosphorus. As ordinarily prepared it is low in calcium. Copper is present in a small amount. Liver, kidney, and brains apparently contain some factor which aids in the utilization of iron and in blood-cell formation. As a source of vitamins, muscle meat is important as a source of the vitamin B complex. Pork is especially valuable as a source of thiamine and veal, turkey and chicken are relatively high in niacin. The organs, especially liver, heart, and kidney, are excellent sources of riboflavin and niacin, and the liver and kidney with some others contain vitamin A. Some fatty meats also contain vitamin A. Any ascorbic acid present in raw meat is believed to be largely destroyed by cooking. Variations in nutritive value due to the difference in animals and in finish are shown in Table 32.

Composition

The characteristics of the different constituents of meat should be recognized if successful methods of cookery are to be employed. The proteins of meat are of two classes, soluble and insoluble. The albumin and globulin of the muscle fiber belong to the first class, and the connective tissue, consisting of collagen and elastin, to the latter. Both albumin and globulin are soluble in dilute salt solutions. Albumin is soluble in cold water and in dilute acid solutions. Albumin and globulin are coagulated by heat considerably below the boiling point.[1] Albumin is toughened by boiling water, and globulin is hardened by intense heat. The insoluble proteins in the connective tissue are hardened by dry heat. In moist heat, collagen is unaffected by a short cooking period, but a longer period slowly converts it to gelatin, thus rendering the meat more tender. The prolonged presence of acid hastens the change of collagen to gelatin. Elastin is not softened by acid or by long cooking in moist heat.

The animal starch, or glycogen, is stored mainly in the liver and is soluble in cold water.

[1] Coagulation of albumin begins at about 55° C. (131° F.) and is completed at about 71° C. (160° F.). Coagulation of globulin takes place from about 45° to 50° C. (113° to 122° F.).

TABLE 32. AVERAGE NUTRITIVE VALUE OF ONE POUND MEAT FROM VARIOUS MEAT CARCASSES*

Meat	Refuse	Food Energy	Protein	Fat	Calcium	Iron	Thiamine	Riboflavin	Niacin
	Per cent	Calories	Grams	Grams	Milligrams	Milligrams	Milligrams	Milligrams	Milligrams
Beef carcass, raw: Side, including kidney fat									
Thin	19	764	69.2	52	40	10.3	.30	.61	16.6
Medium fat	16	1,042	66.7	84	38	9.9	.29	.59	16.0
Fat	15	1,243	62.9	108	35	9.3	.27	.56	15.1
Very fat	12	1,641	54.8	156	32	8.4	.24	.49	13.2
Medium fat carcass, trimmed to retail	16	919	69.4	69	42	10.3	.30	.62	16.6
Lamb carcass or side, raw:									
Thin	31	646	53.5	46.3	31	8.1	.48	.66	15.5
Medium fat	22	1,122	55.6	98.1	32	8.5	.50	.69	16.1
Fat	19	1,526	47.8	146.5	29	7.4	.43	.59	13.8
Pork — Packer's carcass, side, raw:									
Thin	18	1,397	52.5	130	30	7.8	2.55	.61	13.7
Medium	12	1,827	47.6	180	28	7.2	2.31	.56	12.4
Fat	10	2,201	40.1	225	25	6.1	1.95	.47	10.4
Veal carcass or side excluding kidney fat:									
Thin	23	547	69.0	28	38	10.5	.50	.92	23.1
Medium fat	21	681	68.6	43	39	10.4	.50	.91	23.0
Fat	19	823	68.1	59	40	10.3	.50	.91	22.8

* **Composition of Foods — Raw, Processed, Prepared,** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

The fat forms a protection for the muscle and aids in retaining the moisture in meats cooked in dry heat. It is melted by heat and is to a varying extent lost from the meat during cooking.

The nitrogenous extractives are of little nutritive value aside from stimulating the digestive juices, but they are largely responsible for the distinctive flavor of the meat. The extractives which result from the breaking down of muscle proteins increase in meats which have hung for a few weeks. As a result these meats are higher in flavor than meats which have hung for only a few days, and are definitely preferred by some people. The meat of young animals is lower in extractives, hence low or lacking in flavor. Nitrogenous extractives, like the nonnitrogenous extractives and the minerals or the inorganic constituents, are little changed in physical character by cooking. They are dissolved to a greater or less extent and escape into the cooking water.

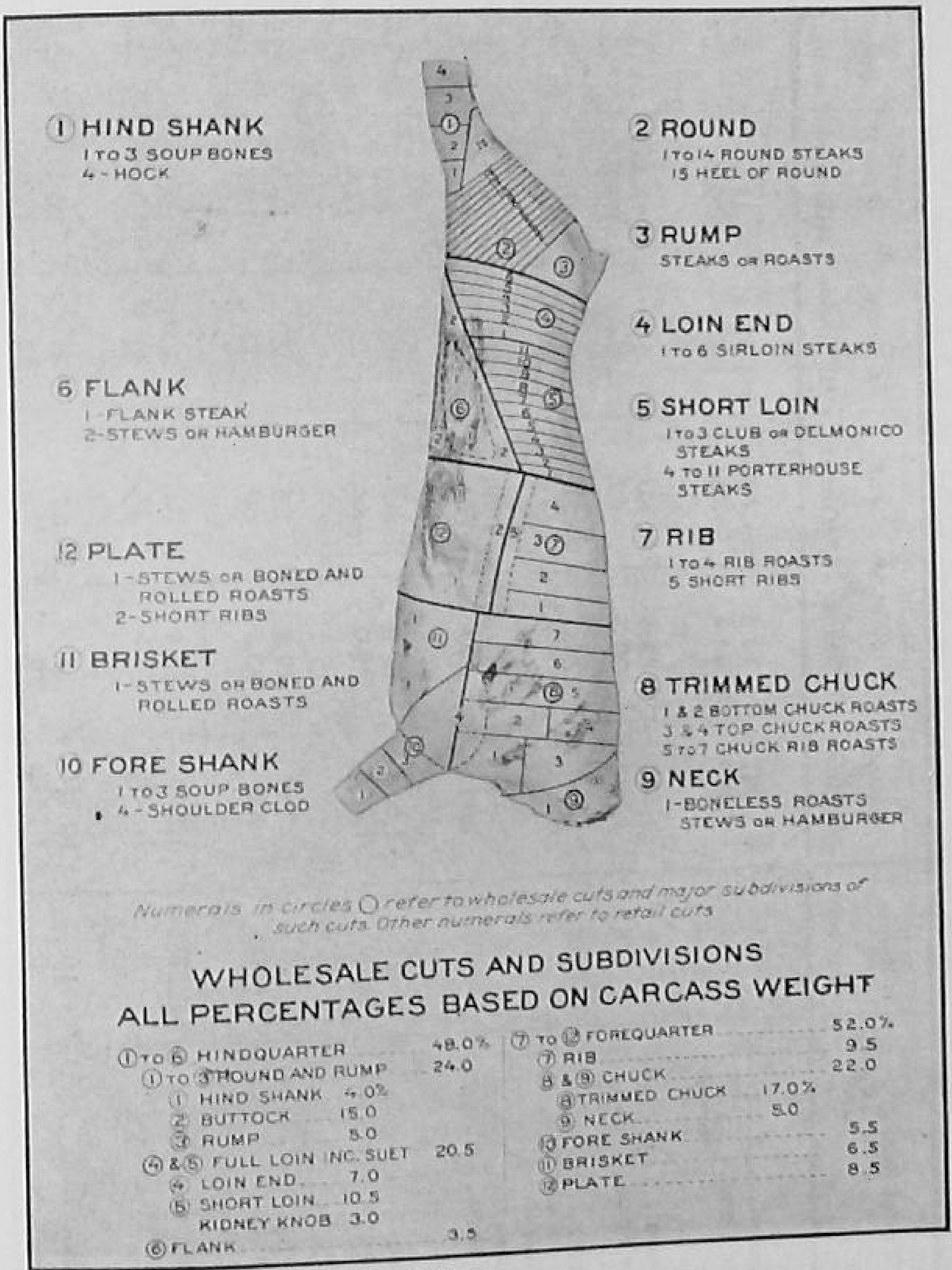
Changes after animal is slaughtered

In most animals, rigor mortis or stiffening of the muscles occurs soon after death. It is a general observation that the animals which develop rigor mortis are more tender after the rigor has passed than immediately after slaughter. Frequently meat is ripened, that is, stored from ten days to six weeks or longer at a temperature a little above freezing. During this time, microorganisms and enzymes cause physical and chemical changes. These include developing of flavor and odor which with long storage may become somewhat old and strong. As a rule, the muscle is more tender and more juicy after ripening than before, due to the action of enzymes and bacteria and to physical and chemical changes. Tenderness increases with storage for a time, but after about twenty days the tendering action proceeds slowly. Whether or not one prefers a well-ripened piece of meat or one aged just sufficiently to give tenderness is largely a matter of personal taste. The well-ripened beef is slightly acid in flavor, strong, and somewhat "gamey." The success with which carcasses can be ripened depends somewhat upon the "finish." A carcass must have a covering of fat in order to be successfully ripened. The fat is thought to inhibit the growth of putrefactive organisms and at the same time to permit the action of enzymes responsible for the changes occurring in ripening. Beef and mutton are frequently ripened. Pork does not improve in either flavor or tenderness with ripening.

The quality of carcasses may vary widely, though the cuts obtained from a given animal are of the same relative quality.

Beef

The waste in different cuts of beef of the same grade and the nutritive value of the different cuts are shown in Table 33. It will be seen that cuts high in fat, as the rump, have high caloric value. The amount of fat varies not only with the cut but with the finish as shown in Table 33. Although fat is essential to a high-quality cut, many persons do not eat it and some even trim it off before cooking.



Courtesy of U.S. Department of Agriculture

Fig. 51

Wholesale and retail cuts of beef are shown on this chart. Familiarity with these facilitates the buying of beef.

TABLE 33. NUTRITIVE VALUE IN ONE POUND POPULAR BEEF CUTS, RAW, WITH AND WITHOUT BONE*

Cut of Beef	Refuse	Food Energy	Protein	Fat	Calcium	Iron	Thiamine	Riboflavin	Niacin
	Per cent	Calories	Grams	Grams	Milligrams	Milligrams	Milligrams	Milligrams	Milligrams
Chuck:									
with bone	13	882	73.5	63.	43	11.1	.32	.66	17.6
without bone	0	1,019	84.4	73.	50	12.7	.36	.75	20.2
Flank:									
with bone	2	1,100	88.6	80.	53	13.4	.38	.79	21.3
without bone	0	1,125	90.3	82.	54	13.6	.39	.80	21.7
Hamburger	0	1,457	73.	127.	41	10.9	.31	.64	17.4
Porterhouse:									
with bone	14	1,157	64.	98.	39	9.8	.28	.57	15.4
without bone	0	1,346	74.5	114.	45	11.4	.32	.66	17.9
Rib roast:									
with bone	21	1,016	62.5	83.	36	9.3	.27	.56	15.0
without bone	0	1,275	79.0	104.	45	11.8	.34	.70	19.0
Round:									
with bone	10	747	79.8	45.	45	11.9	.34	.71	19.1
without bone	0	829	88.5	50.	50	13.2	.38	.79	21.2
Rump:									
with bone	26	1,080	54.4	94.	30	8.1	.24	.48	13.1
without bone	0	1,459	73.5	127.	41	10.9	.32	.65	17.7
Sirloin:									
with bone	10	1,043	71.	82.	41	10.6	.30	.63	17.0
without bone	0	1,158	79.	91.	45	11.8	.34	.70	18.8

* **Composition of Foods — Raw, Processed, Prepared,** Agriculture Handbook No. 8, United States Department of Agriculture, 1950.

Courtesy of U.S. Department of Agriculture

Fig. 52

Less tender cuts of meat are good purchases. Appropriate methods of preparation are important. Pounding in flour and seasonings and then braising makes the meat tender and tasty.

As mentioned earlier, the tender cuts of meat are along the back. The loin is often considered the choice section. From the loin come porterhouse and sirloin steaks, both popular retail cuts. The rib section, also tender, yields choice roasts. The chuck and the round, including the rump, are less tender than the loin and rib sections, but these cuts cooked in moist heat may be palatable and tender. The flank, neck, plate, brisket, shank, and sides of the beef are still less tender. The connective tissue is more developed, the muscle appears coarser, and unless carefully cooked, the product may be quite stringy in appearance.

Although the carcasses of other animals are similar in percentage of waste, there is little variation in tenderness of cuts coming from different parts of the carcasses of veal, lamb, and pork.

Veal

Veal differs somewhat from beef in physical characteristics. Being from the immature animal, it is lacking in "finish," or the fat that is found on mature animals. The flesh is light in color, and there is little or no inter-

mingling of fat. Veal is broken down into retail cuts suitable to the use to be made of them.

Lamb and pork

Lamb carcasses are cut similarly to those of veal, but pork carcasses are cut quite differently from those of other animals.

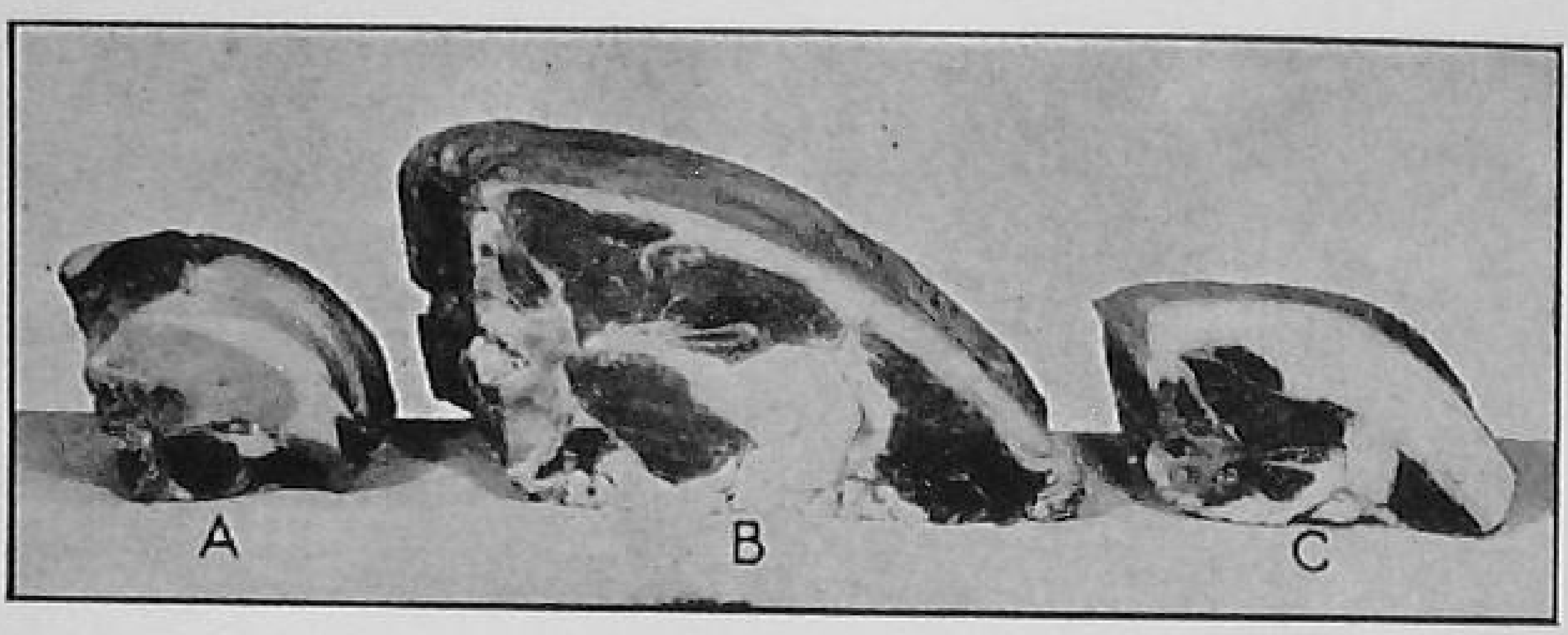


Fig. 53

Loin cuts of (*A*) pork, (*B*) beef, and (*C*) lamb are similar in shape and arrangement of muscles but vary in size.

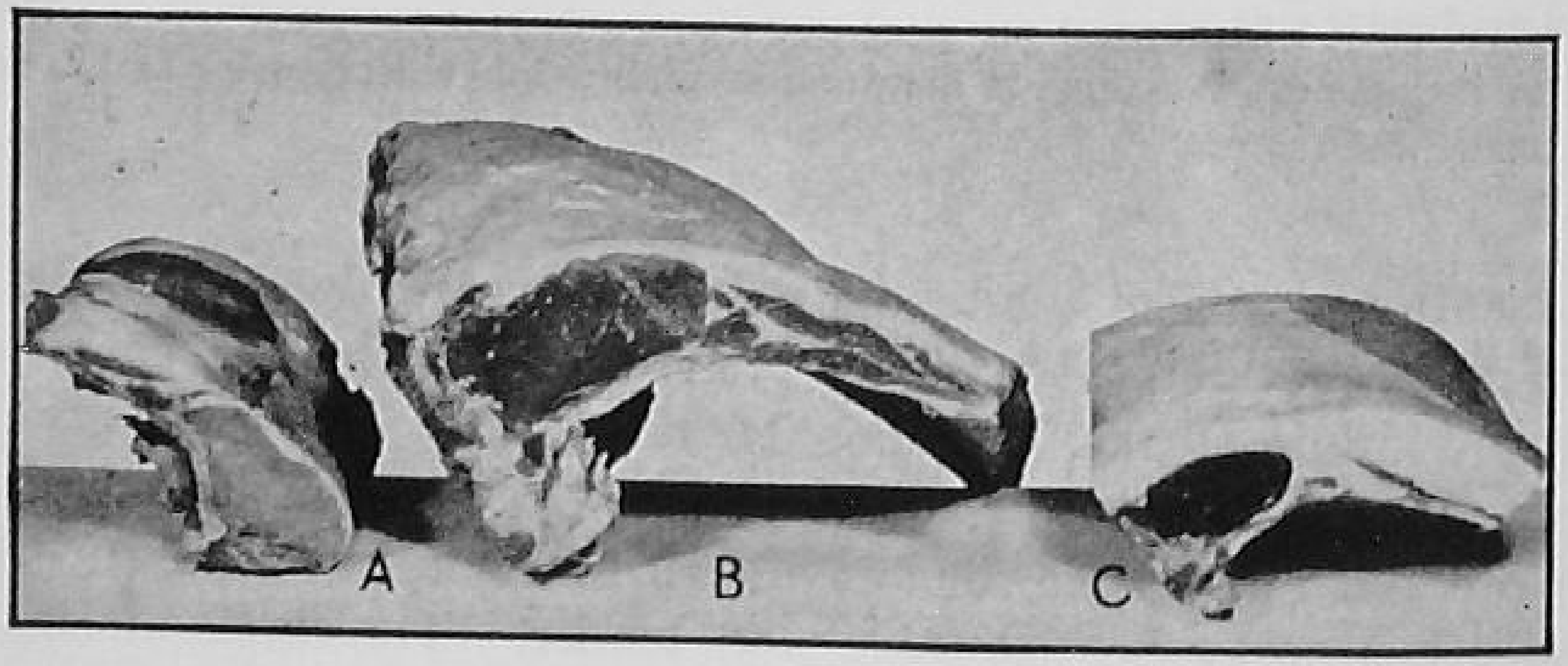


Fig. 54

Rib cuts of (*A*) pork, (*B*) beef, and (*C*) lamb vary in size and in ratio of fat to lean but are similar in that the chief muscle in each is the "eye" muscle.

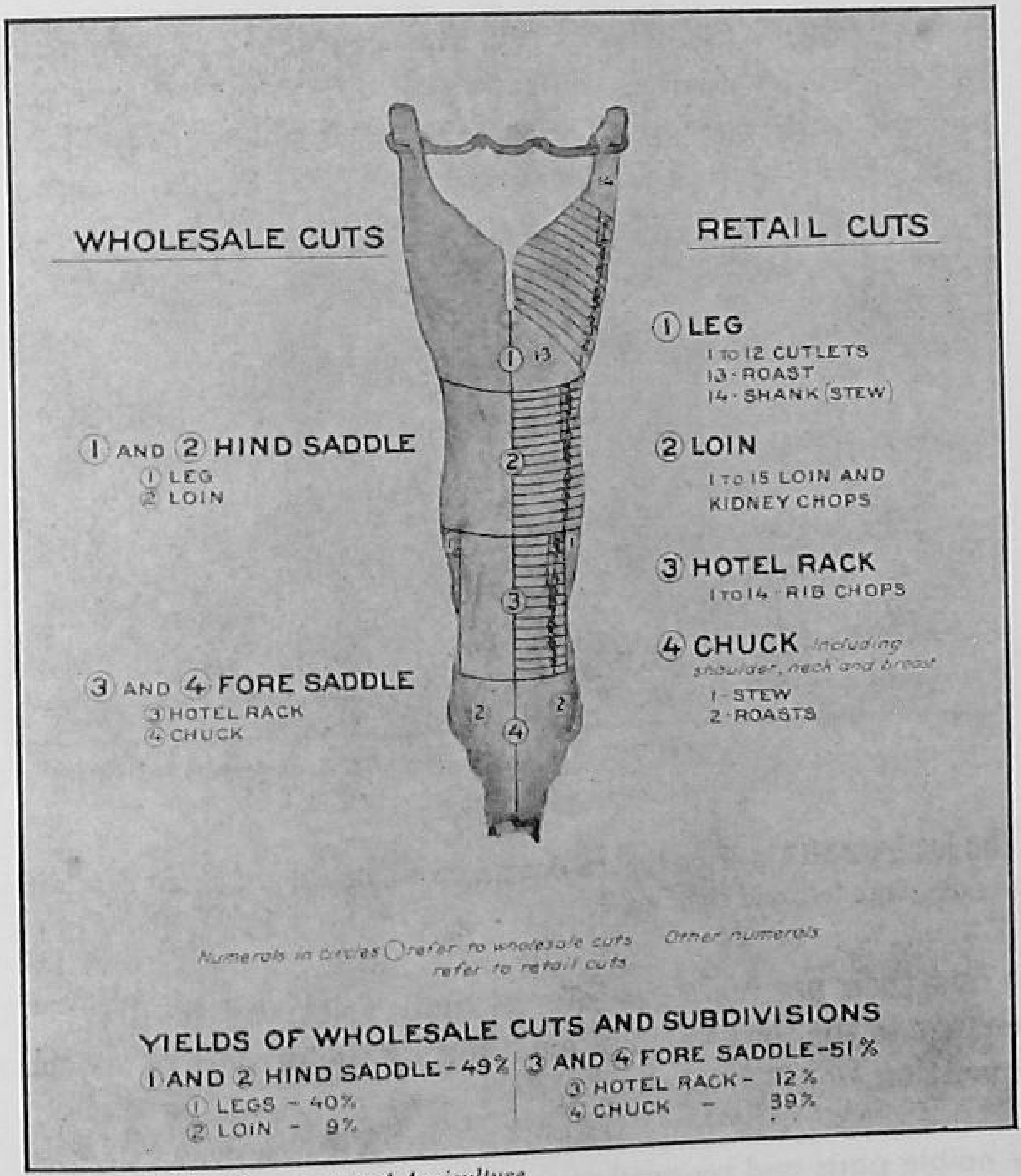
Frozen meats

The freezing of meat as a suitable means for long time preservation is gaining in popularity both commercially and in the home. Much of the frozen meat is boneless, but chops and steaks are also frozen in large quantities. In general, meat to be thus preserved is frozen rapidly at a temperature well below 0° F. Freezing is usually accelerated by use of a blast or by contact with plates or pipes maintained at a low temperature. The

meat is stored at 0° F. or below. As with other frozen foods, careful packaging to exclude air and to prevent drying and a uniform low storage temperature are important. Meat thus preserved retains most of the characteristics of fresh meat. Experimental work, in general, shows that frozen meat is at least equal in quality to unfrozen meat, and in some instances it has been found to be more tender after being frozen.

Prepared meats

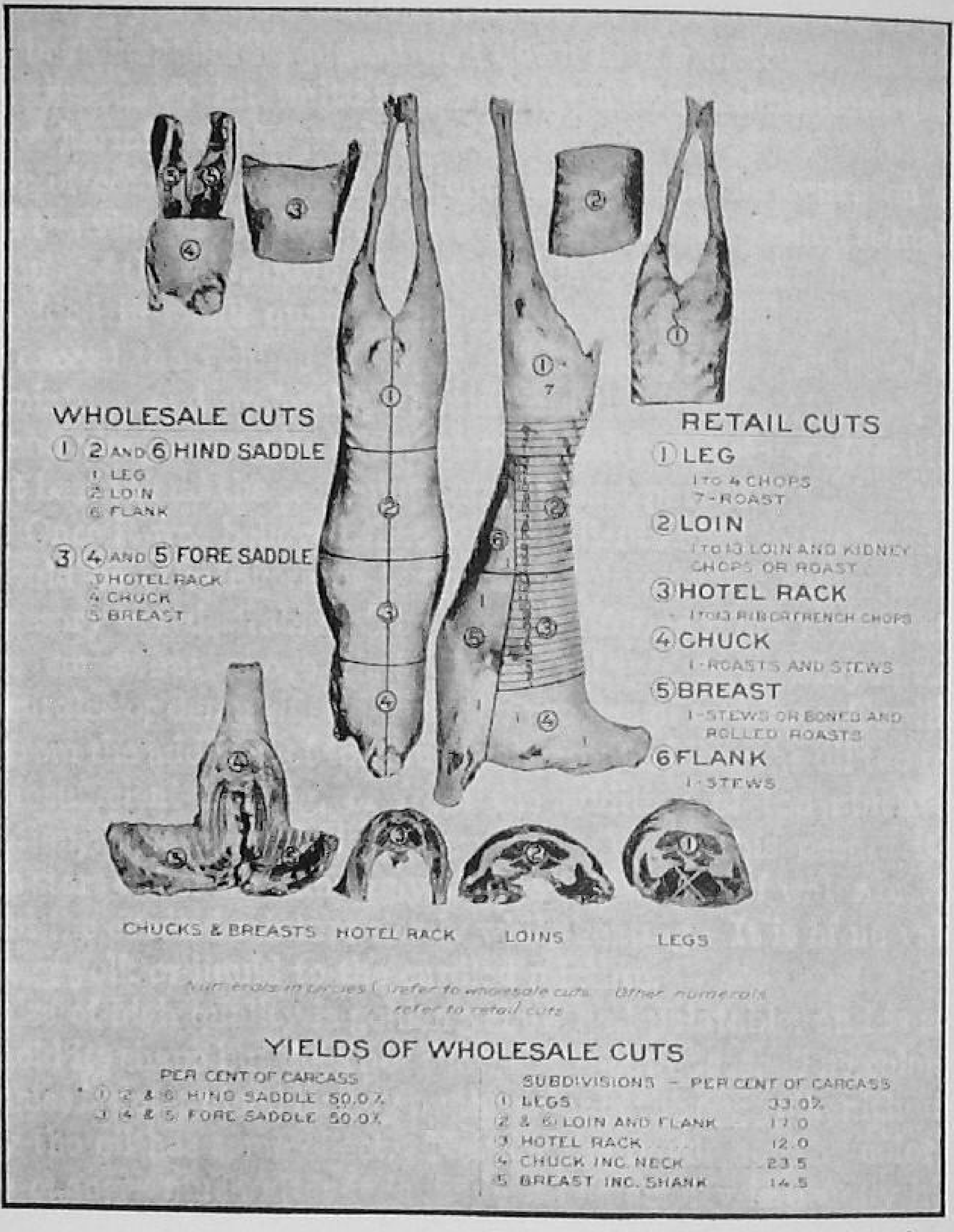
The list of important prepared meats includes sausages, cured hams, cured bacon, dried beef, corned beef, and canned meats of various kinds. These differ greatly in texture and flavor from the fresh product. Because



Courtesy of U.S. Department of Agriculture

Fig. 55

Wholesale and retail cuts of veal, as this chart shows, differ greatly from those of beef.



Courtesy of U.S. Department of Agriculture

Fig. 56

The lamb carcass is often broken down into wholesale and retail cuts without first dividing into left and right sides.

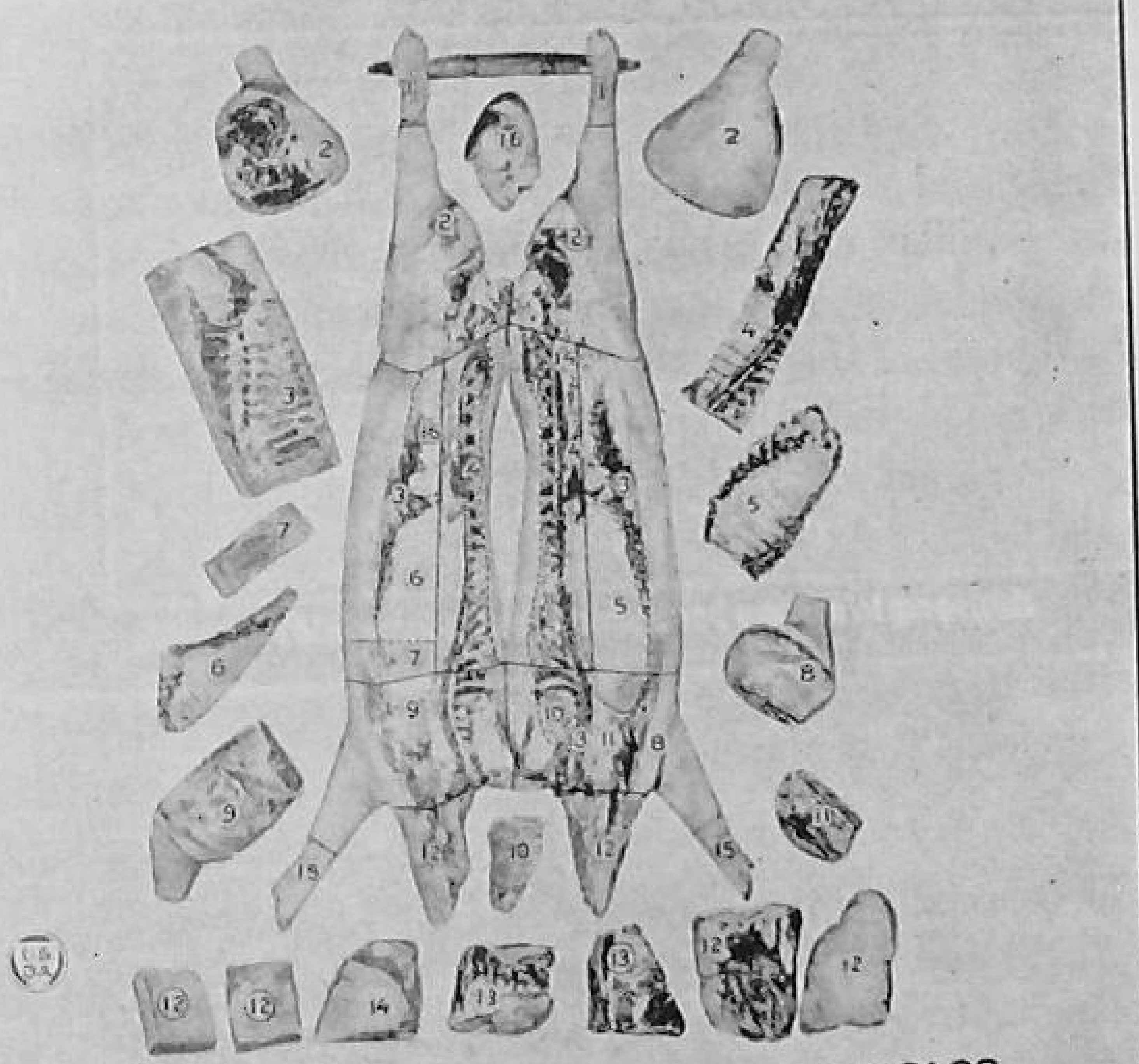
of this fact their use increases interest and variety in the diet. There is little change in the food value of meat during the process of special curing or preparation.

Sundry edible parts and by-products

In addition to the regular cuts of meat obtained from the various carcasses, there are sundry other edible parts, sometimes called "variety

meats." These include the brain, the tongue, the liver, and the heart from each of the animals discussed, the sweetbreads or the thymus glands of calves, the ox tail, and tripe, which is the inner lining of the first or second stomach of the beef.

Among the popular by-products of beef are meat extracts and bouillon cubes. Beef extract is obtained by boiling lean beef in vacuum kettles and straining and evaporating the broth to a product that contains 50 per cent water and is known as fluid extract of beef or to a paste which contains



WHOLESALE CUTS - PERCENTAGE OF CARCASS

1-HIND FEET	1.00%	7-BRISKET	2.25%	12-JOWL BUTTS	2.25%
2-HAMS	19.00	8-PICNIC	7.50	13-BONELESS BUTT	3.05
3-CLEAR BELLIES	16.50	9-N.Y. STYLE SHOULDER	16.00	13-BOSTON BUTT	5.20
4-PORK LOINS	12.75	10-NECK BONES	.95	14-LOIN BUTT	4.00
5-SPARE RIBS	2.50	11-PICNIC BUTT	3.02	15 FORE FEET	.92
6-SPARE RIBS	1.50	12-JOWL BUTTS	3.75	16 LEAF FAT	3.52

Courtesy of U.S. Department of Agriculture

Fig. 57

The pork carcass due to size and distribution of fat is cut quite differently from other carcasses.

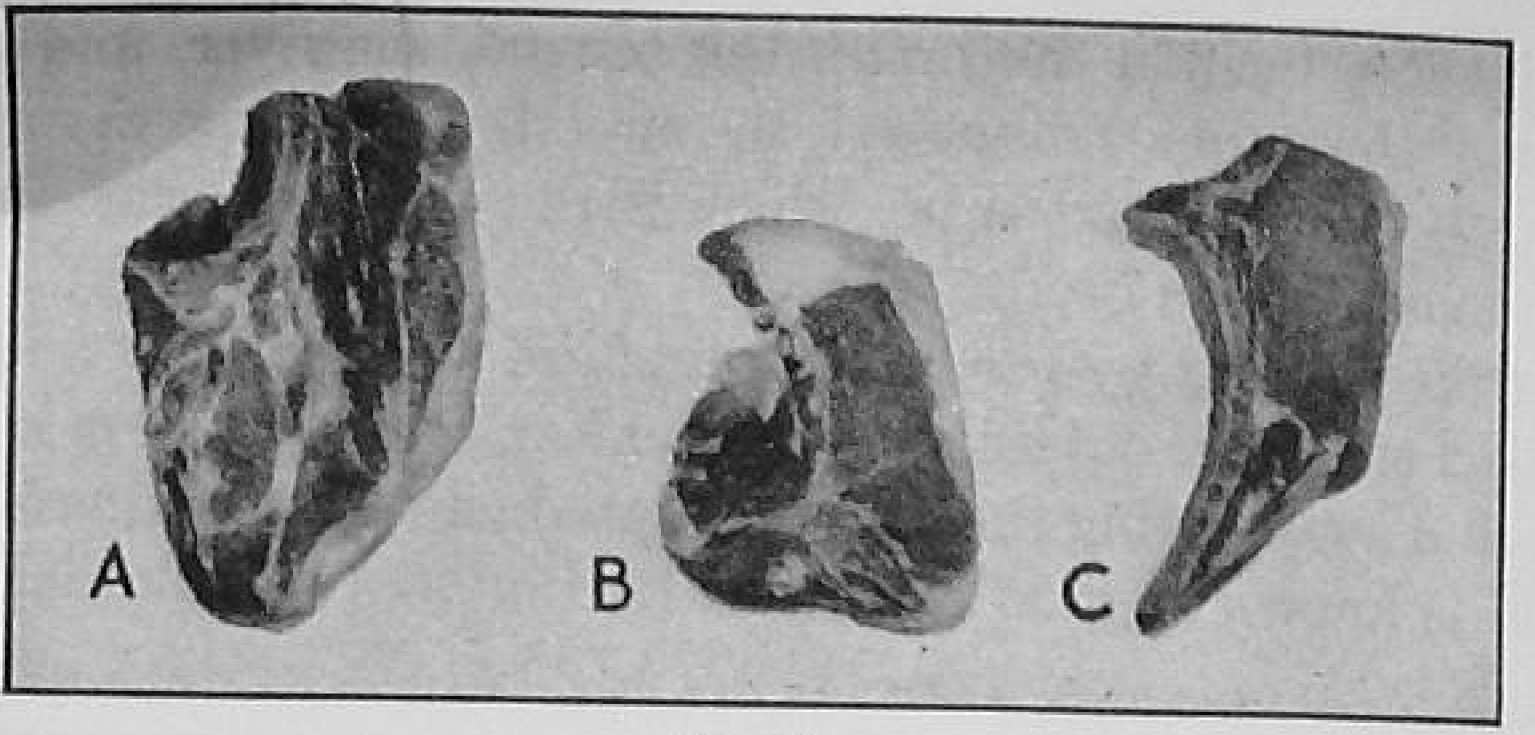


Fig. 58

These pork chops are typical of three "loin chops" found in most markets. (*A*) shoulder chop; (*B*) center loin chop; (*C*) rib chop.

12 to 25 per cent water. The amount of salt added varies from 5 to 20 per cent. Bouillon cubes consist of meat and vegetable extractives and seasoning, the latter including a high percentage of salt.

The food value of these products is slight, they are palatable and have a stimulating effect upon the appetite.

Poultry

Poultry includes mainly chickens, turkeys, geese, ducks, and guineas. The muscular structure of poultry closely resembles that of other meats. Studies that have been made indicate that the nutritive value of poultry differs little from that of other meat.

Fish

Fish is especially prized among certain peoples because of its distinctive flavor and characteristic texture. It resembles other flesh in food value, being an excellent source of protein. It also furnishes phosphorus, and certain of the shell fish are high in calcium and iron. Marine fish have long been recognized as a rich source of iodine. Fish liver oils are a potent source of vitamin D. Fish also supply vitamin A, thiamine, niacin, and riboflavin.

The edible portion of fish varies in fat content from 20 per cent to 0.2 per cent, a fact which has led to the classification of fish as fat and lean. The fat fish have, for the most part, colored flesh; and the lean fish, white flesh. Included as fat fish are butterfish, catfish, eels, herring, mackerel, salmon, sardines, shad, swordfish, and turbot. Lean fish are black bass, bluefish, cod, flounder, haddock, hake, perch, and pickerel. Halibut is intermediate in fat content.

Fish are frequently divided into two classes, fish and shellfish. The shellfish are, in turn, divided into two classes: mollusks, which have a soft, unsegmented body, in most cases protected by a calcareous shell; and crustaceans, which have a segmented, crust-like shell. To the mollusks belong the oysters, mussels, clams, and scallops. The crustaceans include lobsters, crabs, shrimp, and crayfish. Oysters are the most extensively used of all shellfish. Their use has been fostered by the production of oysters on a large scale through oyster farming. Submerged land along the Atlantic seaboard is devoted to oyster culture, and many people are occupied in tending these oyster farms.

Shellfish produced in polluted water may be sources of infection. Hence special care is required in order that shellfish at no time come in contact with water polluted with sewage. This is especially important because many shellfish are eaten raw and few, when cooked, are subjected to a temperature high enough to destroy microorganisms.

The use of fish in the United States is still comparatively small. The per capita consumption of fish in the United States is given as eleven pounds. Racial habits and religious customs influence the use of fish. The stipulation of fish for fast instead of festival days has probably contributed to a rather widespread idea that fish is less desirable than meat. Another false notion that has long persisted is that the use of fish is an indication of poverty. The inability of the cook to prepare fish in an attractive manner has no doubt further limited its use in many households.

Although fish are found distributed well over the face of the earth, the largest fisheries are located in the North Temperate Zone in regions where the water is comparatively cold. The United Kingdom, Norway, Denmark, Ireland, Greenland, and Japan are all important exporters of fish. In North America, each section has its typical fish. The best-known fisheries of this continent are off the Grand Banks of Newfoundland. These fisheries were an important source of fish for the French for over a hundred years before they made their first settlement in the St. Lawrence Valley.

Cod is the most important fish caught off the shores of Newfoundland. The catch of the New England fisheries includes cod, haddock, halibut, hake, pollock, cusk, mackerel, flounder, swordfish, and herring. The value of the first two listed, cod and haddock, has been estimated as more than two thirds that of the total catch. Farther south in the Middle Atlantic States, shellfish are of greatest importance and value. The value of oysters was almost equal to that of all other seafood from this region in 1932. Lobster, crabs, and hard clams are other shellfish found there. Shellfish are also important in the South Atlantic and Gulf fisheries. Here

Table 34. SHELLFISH

Name	Habitat	Description	Season	Method of Preparation
Clam (Mollusk)	Hard shell, round, or little-neck — Atlantic Coast, Maine to Texas.	Small, round, thick shell, and short neck.	Fall, winter, and spring.	Baked, broiled, fried, steamed, in chowders, fritters, stews, or cocktails.
	Soft shell, long, or Mana-nose — Atlantic.	Flat, thin, elongated shell and long neck.	May to October.	
	Razor — Pacific Coast.	Resembles old-type razor.	All year.	
		Is able to travel by standing on edge and extending its foot, crawls along or burrows into the sand. Gathered when tide has receded, leaving bars exposed.		
Crab (Crustacean)	Blue crab — Atlantic Coast, abundant in Chesapeake Bay.	Gray-green or olive green above. Bluish-white below. Blue claws and legs. Shell turns red when cooked. Flesh sweet and tender. Varies in size with a leg spread of from a few inches to several feet.	Hard shell — all year but difficult to get in winter.	Scalloped, creamed, in casserole dishes, cocktails, salads, bisques, or soufflés.
	Pacific or Dungeness — Oregon, Washington, and California.		Soft shell — summer. The soft shell crab is the young.	

Table 34. SHELLFISH (continued)

Name	Habitat	Description	Season	Method of Preparation
Lobster (Crustacean)	Shores of North Atlantic, South Carolina to Labrador. Abundant in eastern Maine and Canada. Crawfish of the Pacific belongs to the same family.	Upper part generally bluish or blackish and green, blotched or spotted below. Turns red when boiled. Flesh sweet, white, and tender.	Plentiful in summer.	Boiled, broiled, baked, scalloped, à la Newburg, in casserole dishes, cocktails, or salads.
Oyster (Mollusk)	Along Atlantic Coast. Taken to Pacific Coast 1872. Native Pacific oyster abundant off coast of Washington.	Rough, irregular, oval-shaped shell. Native Pacific oyster has thin shell. Flesh is soft and slippery. Delicate flavor.	Best September through April	Fried, creamed, scalloped, in cocktails or stews.
Scallop (Mollusk)	New England coast but also in shallow water along Atlantic and Gulf coastline.	Roundish, ribbed shell about 3½ inches in maximum diameter. Only the adductor muscle or hard portion is used.	Middle of September to middle of March.	Fried, à la king, au gratin, in chowder, cocktails or fritters.
Shrimp (Crustacean)	Atlantic, Gulf of Mexico, and Pacific Coasts and many inland waters.	Blue-green. When cooked coral-pink. Body white, striped with pinkish-brown. Shell transparent. Named for its shriveled appearance and curled-up body.	All year, particularly summer.	Fried, curried, deviled, in cocktails, casserole dishes, or salads. One of the most widely used foods of the famous Creole cooking of the South.

shrimp are the important shellfish, with oysters and crabs next in order. On the Pacific Coast salmon is most common. Although the pilchard or sardine exceeds the salmon in volume, its value is less. From the West Coast come also the tuna or "chicken-of-the-sea," halibut, mackerel, flounder, steel-head trout, and bass, as well as oysters, clams, crabs, and shrimp. The Alaskan fisheries are noted for the quantity and quality of the salmon catch.

In addition to marine fish, there are numerous fresh-water fish of importance, though often they are not widely used outside the areas in which they are caught. Black bass, yellow perch, pickerel, pike, shad, brook trout, lake trout, catfish, and whitefish are among the better known fresh-water fish. Frog legs, generally classed in the market with fish, are increasingly found on the market and the menu. Their white flesh and delicate flavor are probably responsible for the esteem in which they are held.

Although 160 varieties or species of fish and shellfish represent the harvest of the fisheries, 12 of these make up over 80 per cent of the total volume. They are salmon, pilchard, haddock, sea herring, cod, tuna and tuna-like fishes, shrimp, oysters, crabs, flounders, mackerel, and halibut.

Because of the many varieties of fish available and the fact that many of them are quite similar, it is almost impossible for the ordinary person to recognize more than a few of the different varieties and species. However, shellfish are more readily distinguishable. Table 34 indicates some of the characteristics of the shellfish.

Fresh fish are iced for a short keeping period. Whole fish, steaks, or fillets may be thus sent to the market. Fillets are often preferred, since they are free of bone and skin, are ready to be cooked, and there is no waste. Steaks, fillets, whole fish and fish sticks may be packaged and quick-frozen.

The preservation of fish by freezing has greatly extended the length of time which they may be kept. Fish, being "cold-blooded" animals, frequently live in cold waters, and the enzymes are thus adapted to acting at low temperatures. As a result, keeping fish by ordinary cold storage is possible for a limited period only. It is said that fish may be kept frozen for a year or more, and when served may be of such quality that it is impossible to detect any difference either in flavor or desirability between the frozen product and a fresh one. Fish are also preserved by salting, smoking, and canning. Thus variety is obtained and fish are made available to all parts of the country throughout the year.

PROBLEM 10 *How shall meat be prepared?*

In spite of the fact that meat is frequently given first consideration in meal planning and is often considered the fundamental part of the meal, many homes serve only a small variety of meats. The ones most commonly found on the market are beef, veal, pork, and lamb. Although the kinds are limited, there are many cuts from each carcass, and each cut differs from every other cut from the same carcass in the percentage of bone, fat, connective tissue, and muscle. This, in turn, causes certain cuts to be better adapted than others to a particular method of cooking and serving. From a given animal, the difference in cuts is dependent upon the portion of the carcass from which they are taken. Within limits, the bony structure of the carcass determines the shape and size of the bones; the muscular structure, the shape and size of the muscle or lean portion; and the use of the muscle, the amount and density of connective tissue.

Selection

Palatability is perhaps the greatest single factor in the choice of a meat. Important in affecting palatability are the species of the animal, the grade of the carcass, and the location of the cut. Also the sex and age of the animal, exercise, feed, and individual inheritance affect palatability. Whether or not the carcass has been freshly slaughtered or, if held, under what conditions it has been held, are other factors. The palatability of meat is judged by its tenderness, texture, flavor, juiciness, color, and aroma. The tenderness and juiciness of a cut are closely related to the amount and dispersion of fat. Generally, when the fat is found well distributed throughout the muscle fibers, the cut is tender and juicy. Meat with this dispersed fat is difficult to obtain and expensive. Juiciness may also be related to the age of the animal and the degree of ripening which the meat has undergone. Tenderness, flavor, and juiciness are all greatly affected by the method of cooking.

Tenderness may be altered by the use of certain agents, usually enzymatic in nature. There are various commercial preparations which are being used with more or less success, though few, if any, of these seem to

have been developed to the state where they produce results which are entirely satisfactory when used in the home.

Cost definitely affects the choice of a meat. However, too often the cost per pound only is considered and the percentage of waste is ignored. Frequently the cuts which cost the least per pound contain only a small edible portion and, as a result, are high in actual cost.

Time and method of preparation should also be considered. A less tender cut, such as a shoulder roast of beef which requires long slow cooking, would not be selected when a short cooking period is to be allowed. On the other hand, it would be foolish expenditure to buy a porterhouse steak for a stew.

Changes during cooking

Meat is cooked to destroy possible pathogenic organisms and to make it more palatable. Cooking coagulates the proteins, changes the color, may convert the collagen to gelatin, melts the fat, results in loss of moisture, and may cause "browning" of the surface during which the protein and fats break down and flavor develops. Cooking should increase the tenderness of the less tender cuts of meat and should not toughen the tender ones. It should result in juicy meat, the center being cooked and the surface not hardened. The method of cooking to be used for a certain cut is determined by the tenderness of the meat, and this in turn depends largely upon the amount and kind of connective tissue and the amount of fat. The retention of moisture in cooked meat seems to be closely related to the amount of fat it contains. The length and the temperature of the cooking period affect juiciness, the loss being greater with longer cooking and higher temperatures.

The change in color during cooking is due to alteration of the color pigments by heat. Rare beef is a bright rose-red color, medium beef is pink, and well-done beef is brownish gray. Veal, lamb, and pork should be cooked well-done, so that the lean is light gray.

Methods of cooking

Meat is cooked by two general methods, dry heat and moist heat. Roasting and broiling are familiar examples of the former, and stewing, with its many variations, of the latter. As a rule, cooking by dry heat does not increase tenderness, and in many instances reduces it. Cooking in moist heat softens connective tissue and makes meat more tender. Generally, then, the tender cuts of meat are cooked by dry heat and the less tender by moist heat.

Roasting

Roasting as originally practiced was the cooking of a large cut of meat before an open fire. The meat was held by a spit and was slowly rotated so that all parts were evenly cooked. Today roast meat is cooked in an oven, and the term roasting is used in much the same sense as baking. Apparently there has been more experimental work on the cooking of meat by roasting than by any other method. Special emphasis has been placed upon the losses in the meat as judged by loss in weight. Some attention has also been given to palatability as related to method of cooking. In spite of many studies, there is still considerable controversy as to the best method of roasting. Formerly almost everyone seared the roast and then cooked it at a low temperature. Such preheating of the oven requires considerable extra fuel. Investigations have shown that instead of decreasing the losses from the roast, searing actually increased them. Searing is still preferred by many because it increases flavor, although actually only the surface of the roast is affected. If searing is used to increase palatability rather than to prevent losses from the roast, as formerly supposed, the meat may be placed in a cold oven and the heat gradually raised to the searing temperature, in which case the waste of fuel is eliminated.

Further study of methods of roasting beef showed the temperature of the oven throughout the cooking period to be a factor. It has been found that the shrinkage is 6.79 per cent at 110° C. (230° F.), 15.83 per cent at 163° C. (325° F.), 25.76 per cent at 218° C. (424° F.), and 30.44 per cent at 260° C. (500° F.). The difficulty of maintaining a temperature of 110° C. (230° F.) and the great length of time required to cook the meat make this an impractical temperature to use. A temperature of 125° C. (257° F.) throughout the cooking period gave excellent results as far as shrinkage was concerned. However, considerable time is required for cooking a roast at this temperature, and when the desired degree of "doneness" is reached, the roast is apt to be pale in color. Everything considered, 149° C. (300° F.) is generally recommended for roasting beef. Other work indicates that in roasting the less tender cuts of meat, such as round bone chuck and rump, an oven temperature of 125° C. (257° F.) gives a more tender roast than does a temperature of 225° C. (437° F.). This seems to be due to the longer cooking time required at the lower temperature.

The length of the cooking period also influences the losses. A shorter time is required for cooking rare meat than for medium- or well-done, if the other factors are the same. Hence, rare meat suffers a smaller percentage of loss than does medium- or well-done meat. Any factor which

reduces the time required for cooking without changing other factors reduces the losses. The use of metal skewers in meat shortens the time of cooking materially. Investigators were able to reduce the time required for a roast to reach a given temperature from 20.2 minutes per pound as required without skewers to 14.3 minutes when 175 grams of metal were used, and to 9.8 minutes when 264 grams of metal were used.

Whether or not salting the roast increases the loss is also a point under discussion. There seems to be rather general agreement that salting has little effect, since the salt penetrates only a short distance into the roast. Most of the salt will probably be found in the drippings.

The proportion of fat, lean, and bone in the meat is also a factor affecting losses. When a high percentage of fat is present, rather a large proportion melts and is lost in the drippings. However, since the fat coats the roast, it usually prevents excessive evaporation, as water does not pass through the layer of fat.

Although basting at intervals of about fifteen minutes may reduce the losses from lean roasts, considerable time is required for such a process. It is probable that basting is more valuable for developing flavor than for preventing loss. Even for this purpose, it is generally considered more satisfactory to lard the roast with strips of fat over the top or by inserting lardoons (long, narrow strips of fat, preferably fat back or bacon, although suet may be used).

The weight, size, and shape of the cut also influence losses. Greater surface area results in greater evaporation. The small thin roast will suffer a higher percentage of loss than will a larger, more compact one under the same conditions.

Whether or not to cover the roaster is no longer a question. Cooking losses are increased by covering. In general, roasts should be cooked in an uncovered pan. This is true for beef, veal, pork, lamb, and even poultry. However, cooking poultry in a covered roaster for at least a part of the time is thought to make the skin more tender and is preferred by many.

To determine when a roast is done is a problem. As roasting does not make the meat more tender, any test is largely one of determining the degree of coagulation of protein in the meat and is frequently associated with change in color. Many directions allow a certain number of minutes per pound for different degrees of doneness. This, however, is affected by the shape of the piece as well as by the weight, by the use of skewers, by the composition of the meat as determined by the proportion of fat, connective tissue, and bone, and by the temperature of the oven.

Suggested cooking periods for beef, veal, and lamb roasts cooked at a

TABLE 35. RELATION OF TIME OF COOKING TO DEGREE OF DONENESS*

Meat	Weight (Pounds)	Degree Cooked	Time per Pound (Minutes)
Standing rib roast of beef.......	6–8	Rare	18–20
Standing rib roast of beef.......	6–8	Medium-done	22–25
Standing rib roast of beef.......	6–8	Well-done	27–30
Center loin pork roast...........	3–4	Well-done	35–40
Rolled shoulder pork roast.......	4–6	Well-done	40–45
Leg of lamb...................	6½–7½	Well-done	30–35
Veal loin roast.................	4½–5	Well-done	30–35

* Belle Lowe, Experimental Cookery, 2d ed. New York, John Wiley and Sons, Inc., 1937, p. 236.

constant oven temperature of 149° C. (300° F.) and pork at 177° C. (350° F.) are given in Table 35. Smaller roasts require a considerably longer time per pound and large roasts a shorter time.

The time-weight gauge is not dependable, as is well demonstrated by Lowe,[1] who showed that the time of cooking two roasts, one weighing 11.5 pounds and the other 11.6 pounds, to the rare stage, varied from 9.3 minutes to 19.3 minutes per pound. Hence it is desirable that a meat thermometer be used in order that one may determine readily the degree of "doneness" of the roast. Meat thermometers are of different types: the short, straight one that necessitates the use of a short compact reading scale; one that is right-angled and has the reading scale on the horizontal arm, and one with a round dial which has the degrees graduated in a circle and an indicator which rotates. The indication of temperature by the latter type is dependent upon the expansion of the attached metal spike. Accuracy of this thermometer requires that the entire spike be inserted in the meat. For thermometers which have a bulb of mercury or other liquid which expands, a sharp instrument is inserted to the center of the roast, withdrawn, and the bulb of the thermometer is then inserted. Care should be taken to get the bulb as near the center of the roast as possible, for the meat heats from the surface toward the center. Although the surface may be hot soon after the meat is placed in the oven, the heat penetrates slowly. Consequently, some time elapses before the center of the roast has increased greatly in temperature. Since roasting results largely in coagulating the meat proteins and in changing the flavor and color rather than in making the meat tender, temperature is a fair indication of

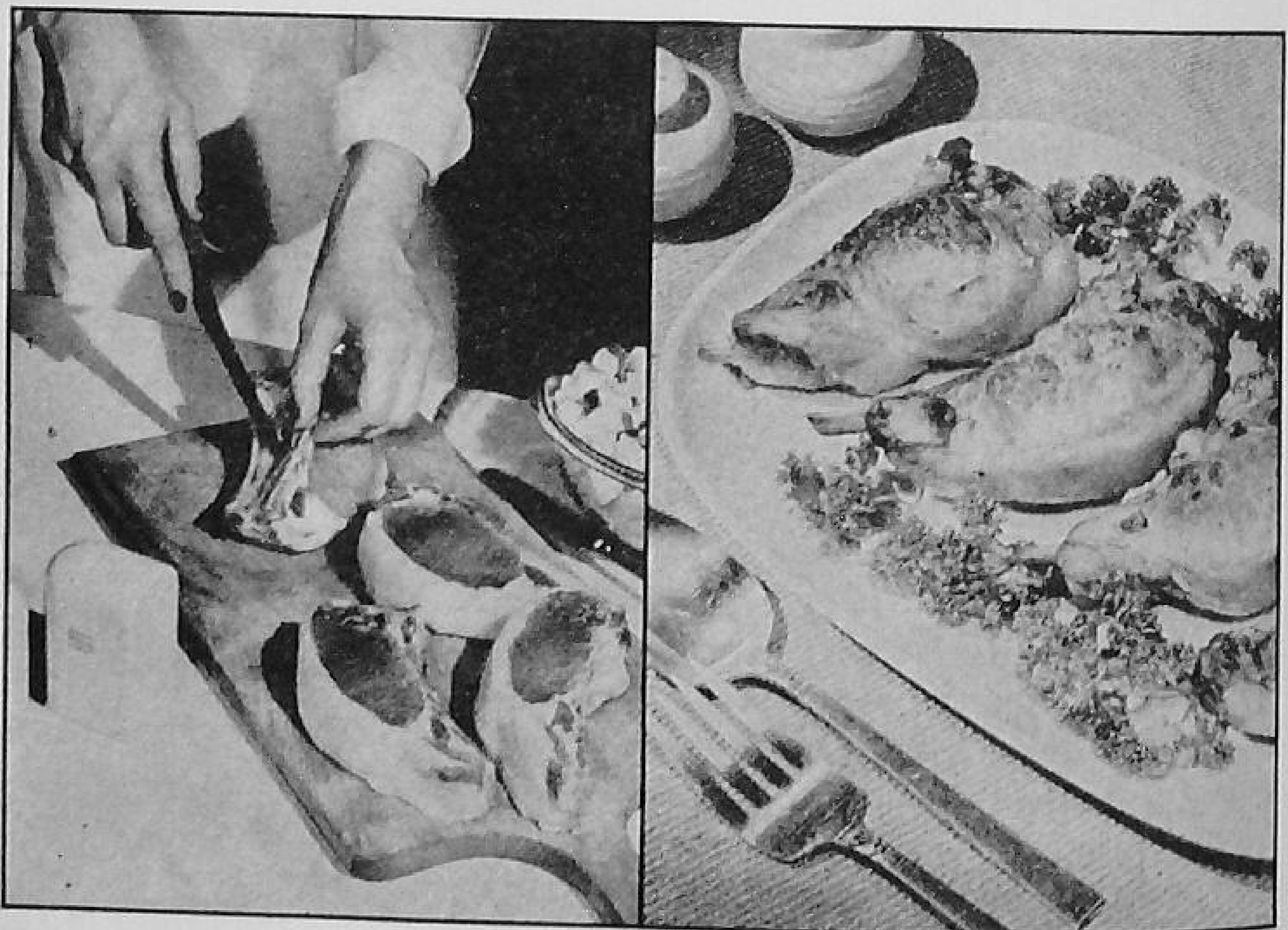
[1] Belle Lowe, *Experimental Cookery*, 3rd edition, p. 246.

the degree of doneness. The following temperatures are suggested as indicating the different degrees of doneness of meat.

Even with the thermometer, the degree of doneness may vary because of internal temperature changes after the roast is removed from the oven if it is not cut immediately. Although roasts cooked until well done show

TABLE 36. RELATION OF TEMPERATURE TO DEGREE OF DONENESS

Meat	Degree Cooked	Temperature to Which Cooked
Beef	Rare	60° C. (140° F.)
Beef	Medium-done	71° C. (160° F.)
Beef	Well-done	77° C. (170° F.)
Fresh pork	Well-done	85° C. (185° F.)
Lamb	Well-done	82° C. (180° F.)
Veal	Well-done	74°–77° C. (165°–170° F.)



Courtesy of Armour and Co.

Fig. 59

Stuffed rib pork chops are prepared by (left) cutting a pocket in preparation for stuffing, then stuffing, closing the opening, and finally cooking. This gives the attractive finished product (right) ready to serve.

little increase after being removed from the oven, roasts cooked medium or rare may continue to rise in temperature for fifteen to forty-five minutes after they are removed. This rise may be of several degrees. Roasts which are cooked at high temperatures show greater rise of interior temperature after the cooking process has stopped than do those cooked in a slow oven. Interior temperature rises more in large roasts after removal from the oven than it does in small cuts.

As suggested earlier, the cuts available for roasting are somewhat limited. Only tender cuts of meat are desirable. The following cuts are suitable:

Beef:
- ribs
- sirloin
- short loin

Veal:
- loin
- leg
- shoulder

Lamb or mutton:
- leg
- shoulder roll
- crown ribs
- loin

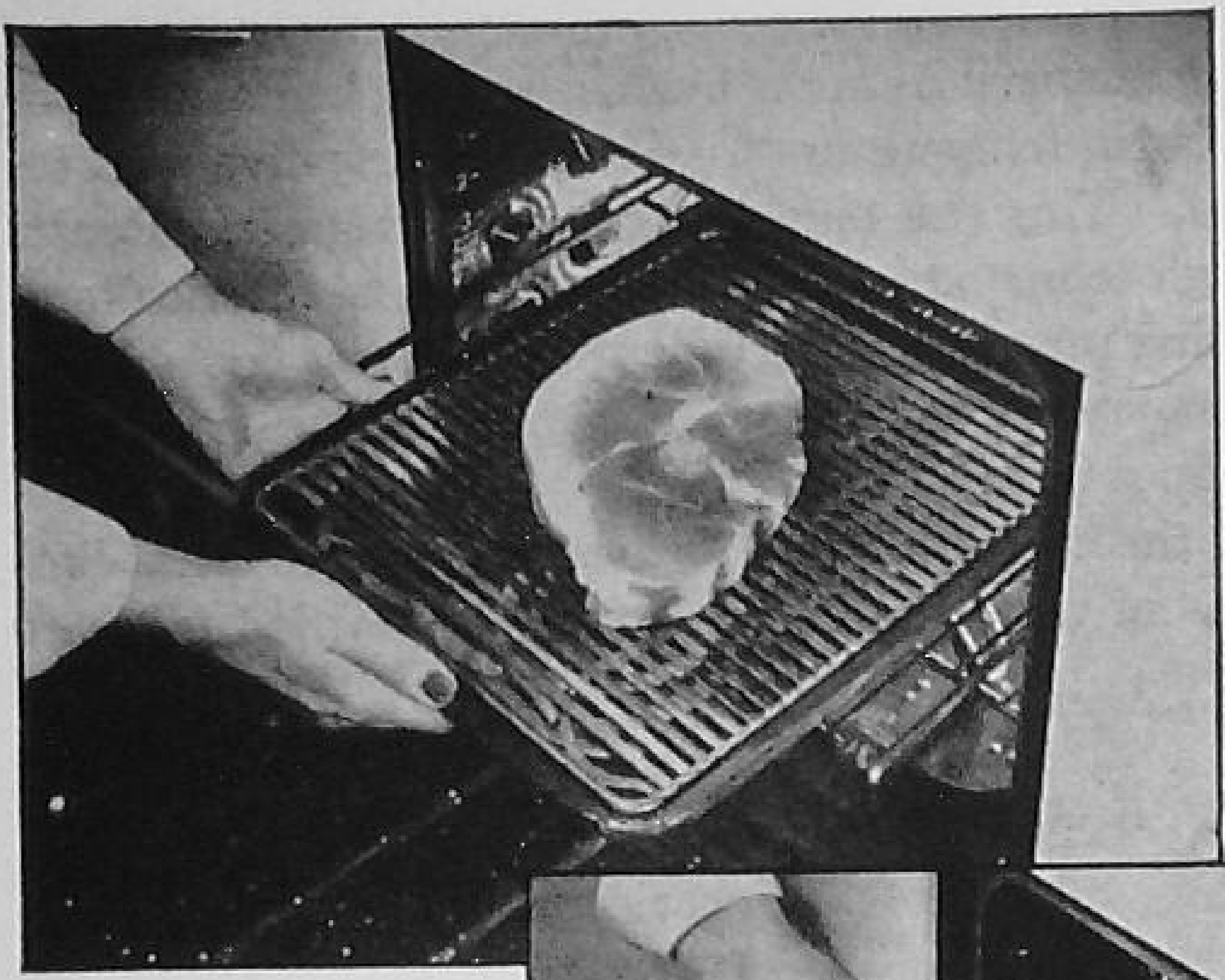
Pork:
- loin
- Boston butt
- shoulder
- tenderloin
- fresh or cured ham
- crown ribs

Veal, which is relatively high in connective tissue, mostly white, offers somewhat the same problem of cookery as the less tender cuts of meat. Early research showed that best results were obtained when the veal was cooked slowly for a long time in the presence of moisture. Moisture was thought essential for softening of the connective tissue. More recent work shows that veal may be roasted satisfactorily in an uncovered pan if a low temperature is maintained. Since veal is low in flavor and lacking in fat, it is often desirable to add fat in the form of salt pork, suet, or bacon. This may be done by inserting the fat into the roast with a larding needle or by scoring the roast and fastening the fat in place on the surface by skewers.

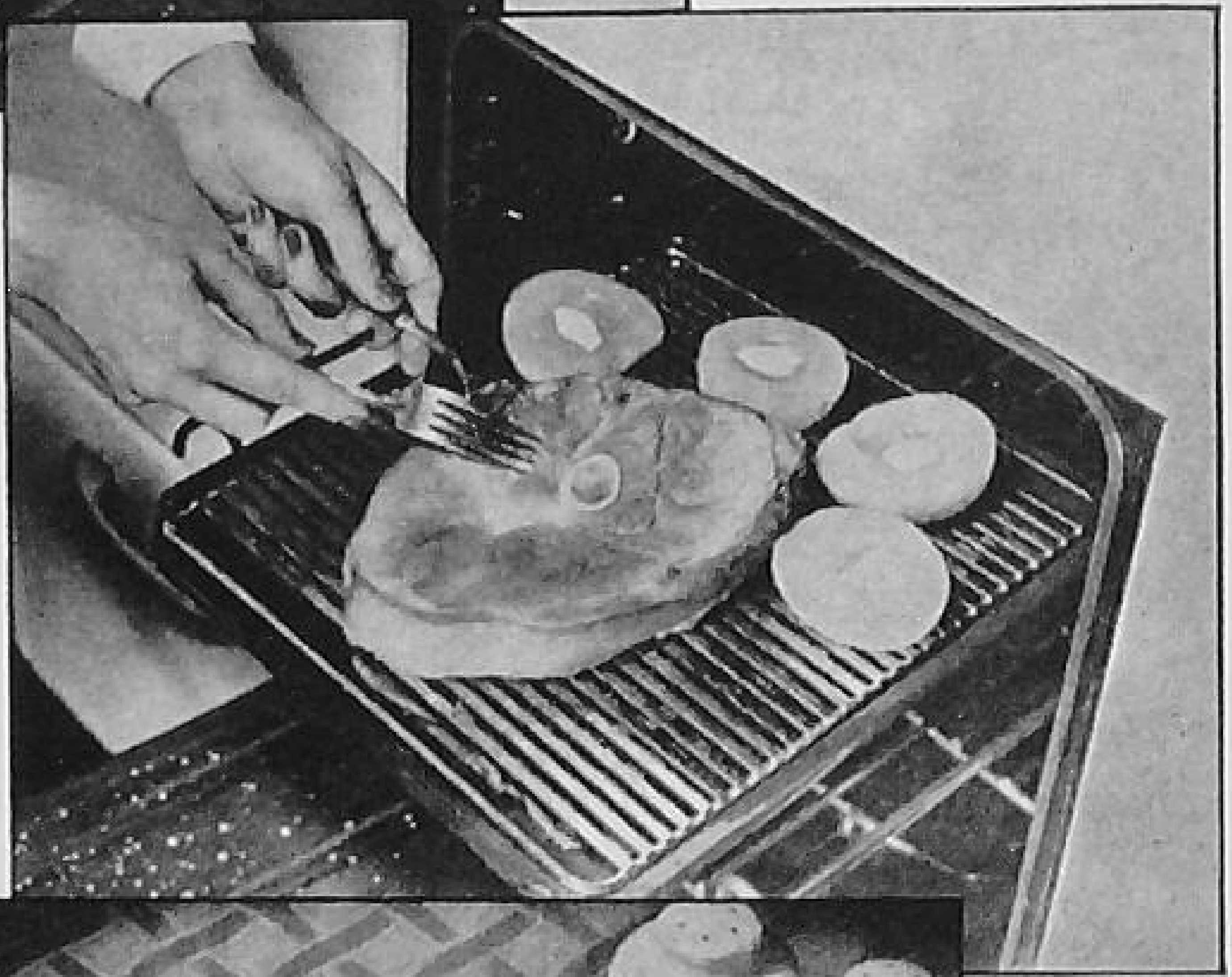
Broiling

Broiling is also done by the application of dry heat, and is generally regarded as suitable for a beefsteak or lamb chop from 1 to 2½ inches in thickness. The heat may be applied directly from the source, or it may be applied by means of hot metal. The latter method is known as pan broiling. It is recommended that a moderate temperature be maintained

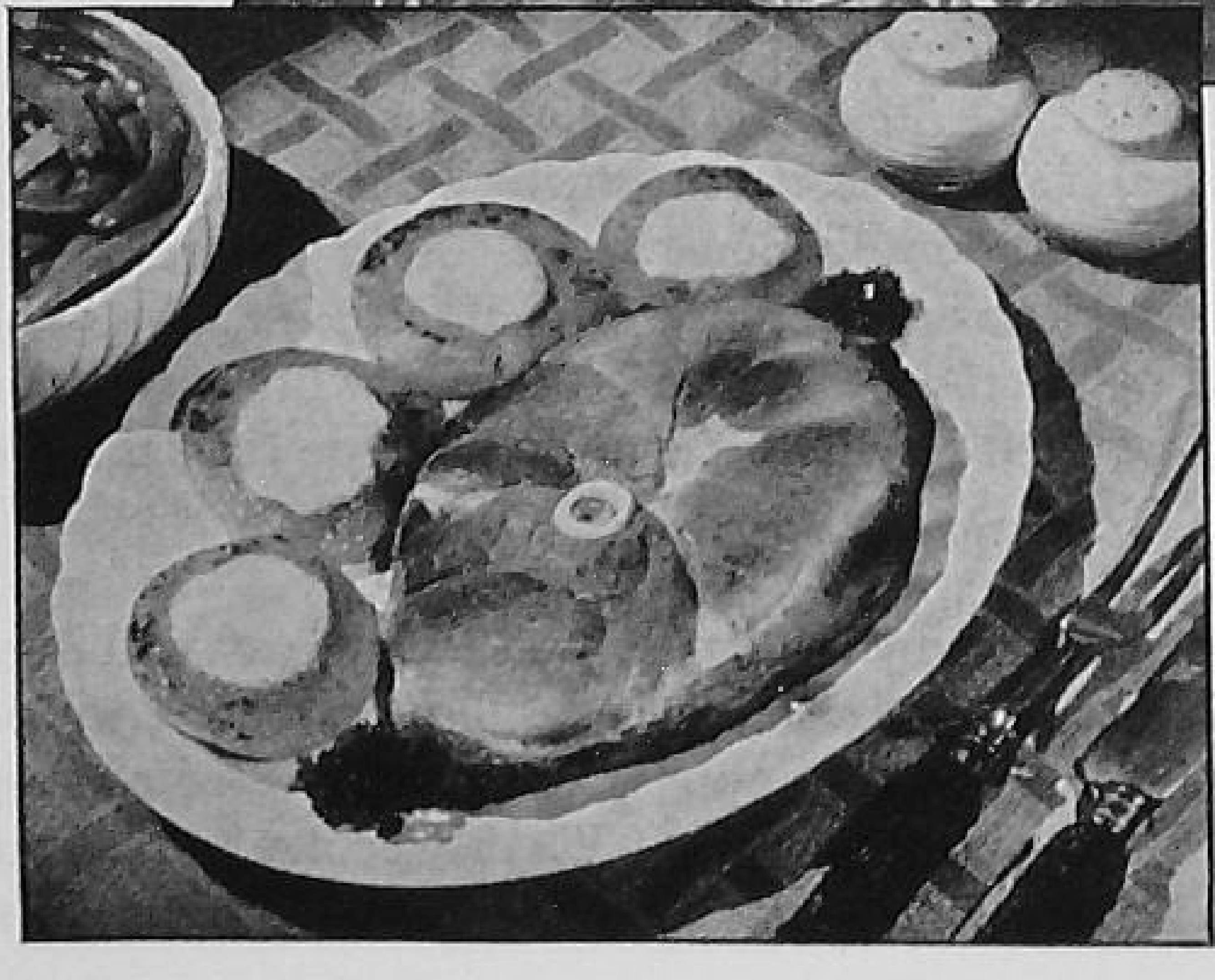
Fig. 60



Broiled ham with peaches and beans makes a pleasing combination. The ham slice is placed on a rack, and cooked beans are placed under it to absorb the meat drippings.



When the ham has cooked half the specified time, it is turned and peach halves are placed on the rack to heat as the ham finishes cooking.



Courtesy of Armour and Co.

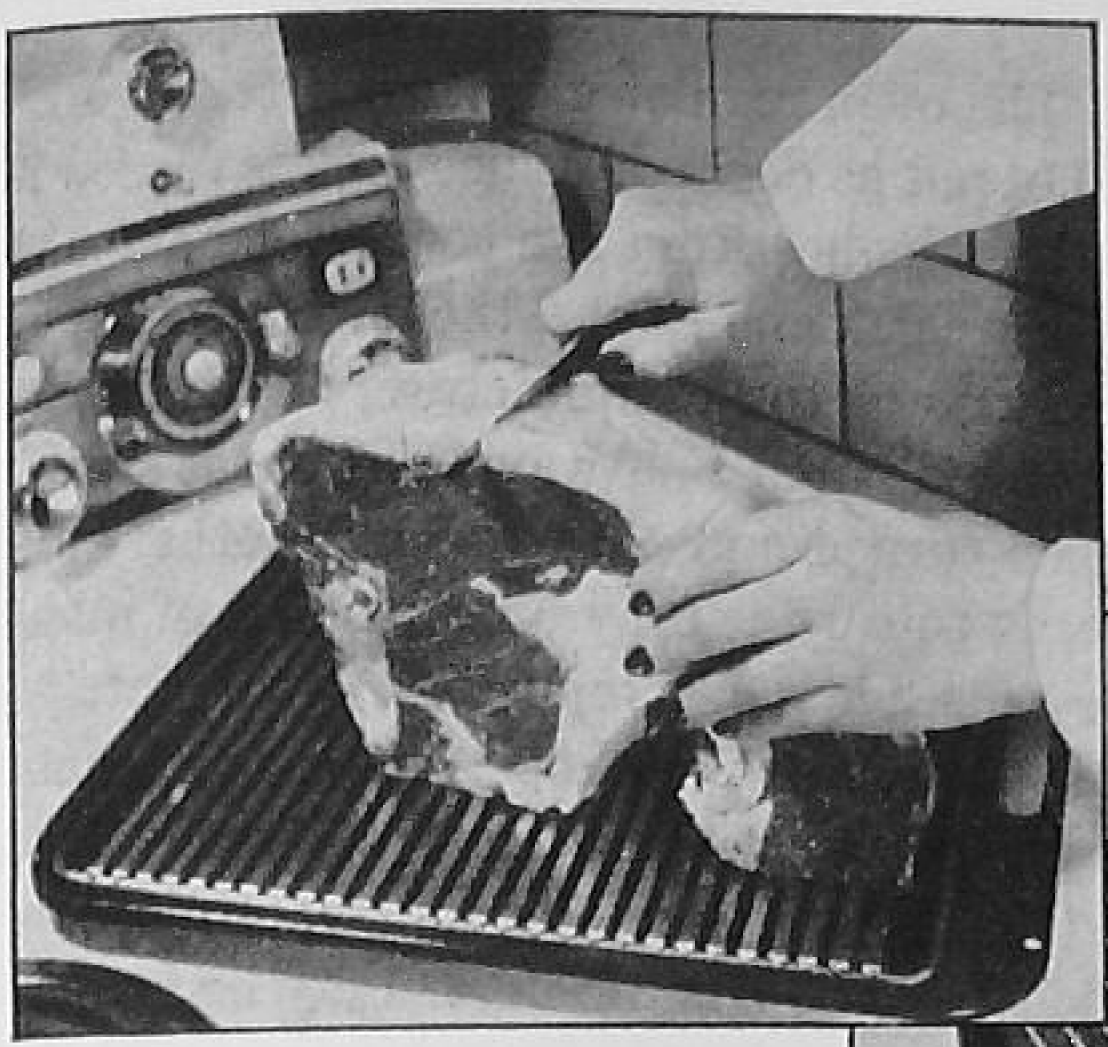
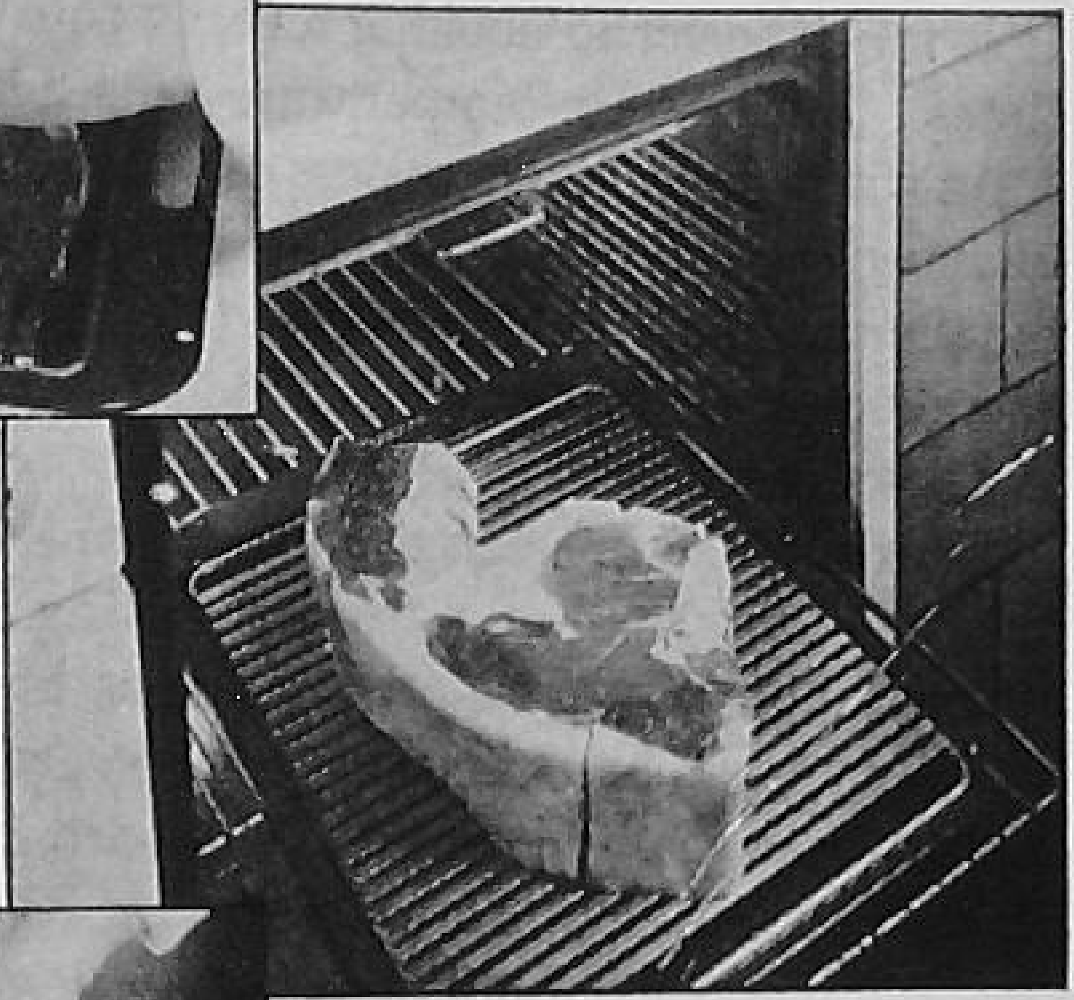


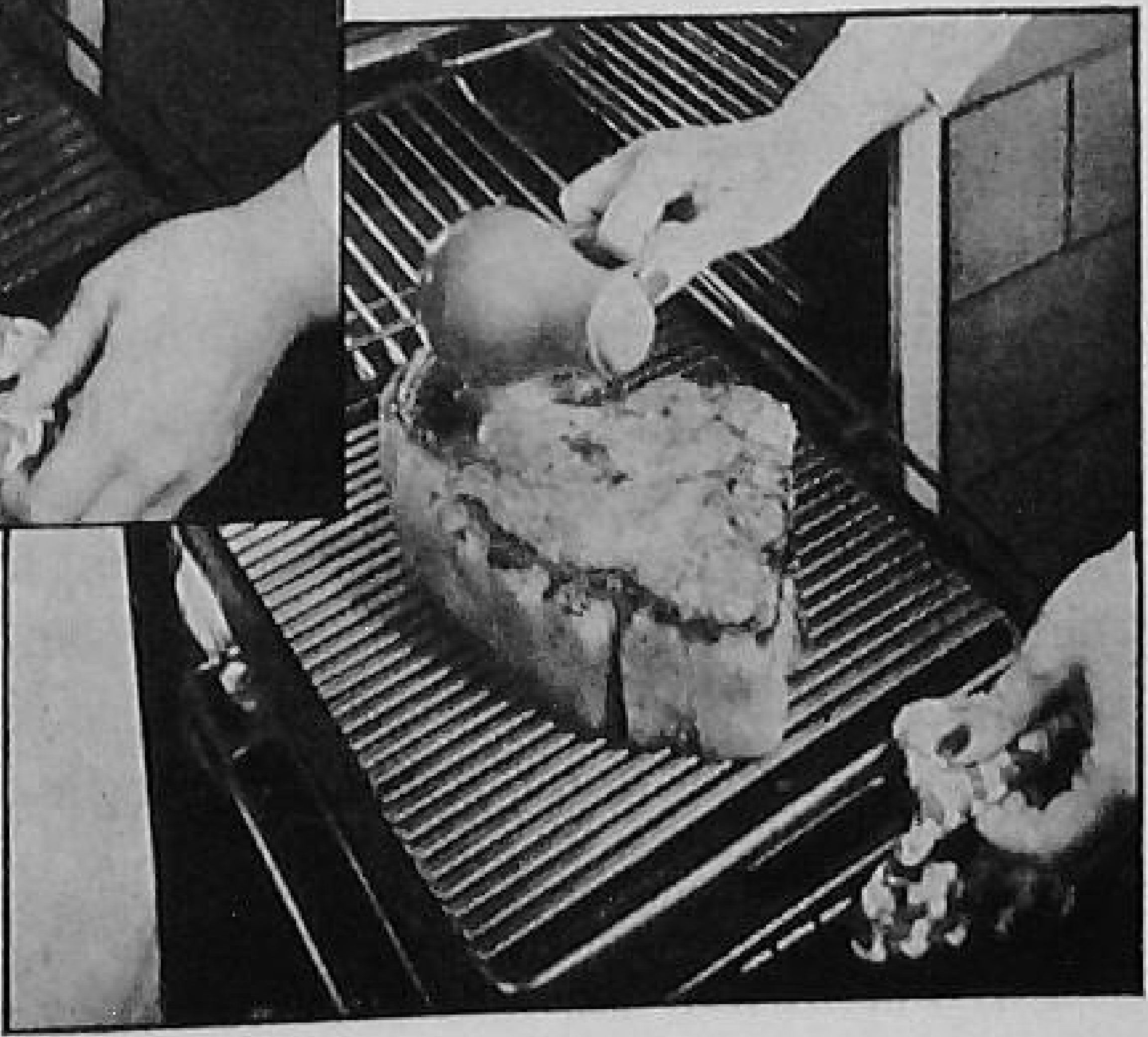
Fig. 61

To broil a porterhouse steak, slash the fat on the outside of the steak to prevent its curling;



place on a rack approximately three inches from the source of heat;

turn the steak half way through the cooking period;



season the meat after broiling as salt tends to draw out the juices from raw meat.

Courtesy of Swift and Co.

throughout the broiling period. The oven regulator is turned to "broil," and the broiler may be preheated or not as desired. The steak is placed in the broiling oven about two or three inches from the source of heat — a thin steak being placed closer than a thick one — and the door is left open or not depending upon the directions of the manufacturer of the range being used. When the steak is cooked about half-way through, it should be sufficiently browned. It is then turned and cooked on the other side. It is much easier in cooking a steak to turn it only once instead of many times. A moderate temperature causes less decomposition of the fat.

As with roasts, the doneness of a thick steak or chop may be determined by inserting a thermometer into the meat. A steak may be turned when the thermometer registers 40° C. (104° F.), and cooking continued until the desired degree of doneness is reached. The thermometer may be rotated to insure ease in reading.

Although there is some evaporation and volatilization, the chief losses in broiled steaks are due to the melting of fat which would, in all probability, be discarded anyway. Steaks broiled at too high a temperature are likely to be hard and dry on the surface while still rare in the center. A thin steak may become dry and hard even with a short cooking period. Six to twelve minutes are allowed for broiling a steak one inch thick, the time varying with the degree of doneness desired. Cuts of meat suitable for broiling are:

Beef:
- tenderloin
- porterhouse steak
- sirloin steak
- club steak
- ground beef patties

Pork:
- cured ham
- cured bacon

Lamb or mutton:
- loin chops
- rib chops

Veal has too little fat to make a desirable broiled meat. Fresh pork requires longer and more thorough cooking than is possible in broiling.

Pan broiling is applicable to the same cuts of meat as in oven broiling but differs from the latter in that the meat is cooked by contact with a hot metal rather than by radiated heat. In pan broiling it is necessary to pour off any fat which accumulates, otherwise frying rather than pan broiling results. As a rule, more frequent turning is desirable than in oven broiling.

Frying

Fried meat may actually gain in weight during the cooking period due

to the absorption of fat. Meats cooked in fat are generally browned first and then cooked slowly until tender. Sometimes meats to be fried are first rolled in flour or in egg and crumbs. This gives a brown surface crust and also protects the meat from the intense heat of the fat. Cuts of meat suitable for broiling are also suitable for frying.

Braising

Although braising may be considered a form of stewing, this method has become so widely used as to merit a separate paragraph. Braising in-

Courtesy of National Live Stock and Meat Board

Fig. 62

Center loin pork chops may be garnished with spiced crab apples to give a tasty colorful dish.

cludes the following steps: browning the meat, which may or may not be dredged with flour, in hot fat or in a hot oven; placing the meat on a rack in a heavy container, tightly covered; and cooking it slowly to the desired degree of doneness. Pot roasts, Swiss steaks, veal chops, pork chops, and many other meats are prepared by braising. A small amount of liquid may be added, or the meat may cook in its own juices. Vegetables may be added, in which case they are added long enough before the meat is thoroughly cooked to be ready to serve with the meat.

To increase the tenderness, meats to be braised may be pounded or hacked. Grinding and "cubing" are also treatments used to render meat more tender but these are less frequently applied to braised meats.

Acid in the form of tomatoes or sour cream is often used with Swiss steaks and other braised meats. Tests indicate that a duplicate cut of meat cooked without acid is as tender as one to which acid has been added. In the usual cooking period there is not sufficient time for the acid to penetrate the meat and bring about a tenderizing effect.[1]

The meats may be marinated, that is, soaked in a mixture of oil, seasonings, and vinegar or lemon juice for some time before cooking in order to improve flavor. For the marinade a mixture of one part vinegar and three parts oil is thought to give the best flavor. The seasonings depend upon personal taste. They may include in addition to salt and pepper, thyme, sage, minced onion, celery seed, parsley, bay leaf, marjoram, sliced carrots, peppercorns, allspice, cloves, and mustard. In early days meat was often soaked in sour milk. Today sour cream, containing both acid and fat, is sometimes used as a marinade.

Stewing

Stewing with its many variations implies the addition of water or other liquid to the meat during cooking. The meat may or may not be browned first, depending on the type of dish desired. The term boiling, as frequently applied to the cooking of rather large pieces of meat in water, is a misnomer, for the meat should not be cooked in boiling water. Rather, it should be simmered or cooked below the boiling point. Losses at boiling temperature are greater. There is more likelihood that the collagen will be completely dissolved, and the muscle fibers will fall apart, becoming stringy and dry.

There is little difference in loss of food value whether the cooking is begun in hot or in cold water. Preliminary searing affects the flavor rather than the retention of food value in meat. The size of pieces is quite im-

[1] Lowe, *Experimental Cookery*, p. 235.

portant in determining the loss of flavor and food value in the cooking water. Therefore when a rich, highly flavored broth is desired, the meat is cut into small cubes so that as much of the surface is exposed to the water as possible. The length of the cooking period also affects the loss of flavor. Long, slow cooking is conducive to the maximum flavor and food value in the broth or cooking water.

Stewing and similar methods of cooking in moist heat are suitable for all less tender cuts of meat. Those especially suitable for cooking in moist heat are:

Beef:
- rump
- round
- shank
- flank
- tail
- chuck
- neck
- plate and brisket

Veal:
- all cuts

Lamb or mutton:
- shoulder
- breast
- neck

Pork:
- all cuts

Cured meat

Cured meats, hams especially, are frequently "boiled." Again "boiling" should mean cooking at a temperature below the boiling point of water. In fact, a temperature of 82° C. (180° F.) or a temperature at which the surface of the water does not even ripple shrinks hams less than a higher temperature. The internal temperature at which a ham is pronounced "done" varies from 70° to 77° C. (158° to 170° F.) according to personal taste. At the higher temperature the ham is a little less juicy, but the flavor is preferred by some. Cooling hams in the broth in which they are cooked decreases loss. As a rule, hams cooked in water show less loss than those cooked by other methods. Cured hams are often roasted. The mild cured hams may be cooked in the uncovered roaster without preliminary treatment. Other cured hams may require soaking before baking. Cured pork may also be cooked by broiling or braising. Many cured meats, such as the especially treated, so-called "tenderized" hams, are wrapped in packages containing directions for cooking. It is generally wise to follow these as they have been worked out especially for a specific product. Tenderized ham is prepared by pumping the curing brine or pickle through the veins until the weight of the meat has greatly increased. It is then smoked at a temperature of about 140° F. Steam is quite often introduced along with the smoke to maintain a high humidity. The exact

technique of preparing tenderized ham is considered a trade secret, and each packer has his own formula.[1]

Frozen meat

Frozen meat may be cooked by the same methods used for fresh meat. It may or may not be thawed before cooking. If not thawed, a considerably longer cooking period is required. Roasts thawed during cooking may require 1½ to 2 times as long to reach the desired degree of doneness as thawed or fresh meat. Steak 1½ inches thick may require 14 to 20 minutes to reach the medium done stage if fresh or completely thawed and 30 to 40 minutes from the hard frozen stage. The meat varies little in palatability, nutritive value and shrinkage during cooking whether thawed as part of the cooking procedure, at room temperature, or in the refrigerator. However, when thawed the meat should be cooked at once for there seems to be more drip accumulated on thawed meat than on fresh meat.

Cooking poultry

The cooking of poultry closely resembles the cooking of other meats. The toughening of the flesh with age is very evident in poultry. As a result consideration is given the age of the bird in deciding upon the method of cookery to be used. Poultry may be broiled, fried, roasted, or stewed. The small young bird is suitable for broiling, and one a little larger and older may be selected for frying. Young roosters, hens, and capons may be roasted, and mature hens or roosters as well as younger birds may be stewed.

Poultry is broiled in the same manner as other meats. It may be fried in a large or a small amount of fat. Usually it is rolled in flour or in egg and crumbs before frying. This aids in browning and also gives a crust which many like. Because of the skin, poultry offers a problem in roasting that other types of meat do not. If it is roasted uncovered, the skin becomes somewhat tough and dry. For this reason the bird is often covered for the last half hour of cooking. The skin seems to be somewhat softened by the steam, and the juiciness and tenderness of the roast are not decreased. Frequently the bird is stuffed before it is roasted. This is generally followed by trussing, or fixing the wings and legs close to the body so that they do not become too brown while cooking. It also makes a more attractive product for serving. To insure juicy breast meat, the roasting is usually done with the breast down. An oven temperature of

[1] von Loesecke, *Outlines of Food Technology*, p. 206.

from 250° F. to 350° F. is satisfactory for roasting poultry. When a temperature of 325° F. is used for roasting chickens, a desirable product is obtained when forty-five to fifty-five minutes per pound is allowed.

As with other meats, a thermometer may be used to determine doneness. It is suggested by different workers that when a thermometer is placed in the thickest part of the thigh the bird is done when a temperature of 85° C. or 90° C. (185° F. or 192° F.) is reached. Again it is suggested that if the bird is stuffed, the temperature of the stuffing should reach 80 to 83° C. although at least one worker suggests 74° C. as being adequate. Obviously there is not complete agreement on the use of the thermometer in roasting poultry, and it is not widely used for this purpose.

Cooking fish

Comparatively little work has been reported on fish cookery. Everyday experience indicates a lack of connective tissue in fish. The collagen content is undoubtedly low, and it is suggested that elastin may be entirely lacking. Whether this is true or not, cooking fish so as to retain its shape offers problems. The muscle fibers separate readily due to the disintegration of the slight connective tissue that holds them together. Especially is this noticeable when fish is cooked in moist heat. This has led to the practice of baking and steaming fish on pieces of cloth, which enables one to lift the fish from the container without breaking it. When fish is cooked in water, it may even be tied in pieces of thin cloth as an aid in retaining its shape. High temperatures tend to increase the losses and yield a dry and more or less tasteless product. Low to moderate temperatures are desirable.

Fish may be cooked whole, split, or in the form of steaks or fillets, depending upon the amount being prepared and the method of cooking. The time required is comparatively short. Fish is thoroughly cooked when the flesh "flakes" or separates easily when tested with a sharp-pointed knife.

A rough division of fish into two classes, fat and lean, is of value in determining suitable methods of cooking. The fat fish are usually cooked by broiling, steaming, "boiling" and similar methods where no fat is added. The lean fish are generally improved by the addition of some fat, so may be fried, well larded and baked, or marinated and broiled.

The flavor of fish, although sometimes quite distinctive, is, as a rule, rather mild. Preparation to bring out the flavor requires care. Foods served with the fish to add decided flavor and color aid in making a more acceptable dish. Acid flavors combine well with fish. Lemon may be used

Table 37. PREPARATION OF FISH *

Kind of Fish	Form	Suitable Method of Cooking	Suitable Accompaniment
Black bass	Split	Broil, fry	Lemon
Bluefish	Split	Bake, broil, fry, plank	Sliced tomato, sliced pickles
Brook trout	Split	Broil	Sliced cucumber
Cod	Steaks	Broil, bake	Melted butter, lemon sprinkled with paprika
Flounder	Fillets	Bake, fry	Lemon, parsley
Haddock	Fillets	Broil, bake	Mock Hollandaise; grilled tomatoes; sauce tartare
Halibut	Steaks	Broil, bake, steam	Cucumber sauce
Lake trout	Split	Bake, broil, fry	Melted butter, parsley
Mackerel	Split	Broil, bake	Sliced cucumber
Perch	Split	Broil, fry	Broiled tomatoes
Salmon	Steaks	Bake, broil, steam	Sliced cucumbers; egg sauce
Sea bass	Split	Broil	Lemon
	Whole	Stuff and bake	Tomato sauce
Sea trout	Split	Broil, bake	Melted butter; minced parsley
Shad	Split	Bake, broil	Lemon, radishes
Sole	Fillets	Fry, broil, bake	Grilled tomatoes; melted butter
Tuna	Steaks	Bake, broil	Lemon sprinkled with paprika
Whitefish	Split	Bake, broil, fry	Lemon; parsley
	Whole	Stuff and bake	Parsley sauce

* Adapted from Heseltine and Dow, **Good Cooking Made Easy and Economical.** Boston: Houghton Mifflin Company, 1936, pp. 194–195.

both as a garnish and as a flavor. Crisp vegetable salads are also good. Frequently a sauce high in fat, such as drawn butter, is served with lean fish.

Table 37 suggests methods of cooking fresh fish and suitable types of sauce or garnish.

Canned and frozen fish, for those who dwell inland, can well be used in the place of fresh fish. In addition to the well-known salmon, crab meat, tuna fish, sardines, and shrimp, there are available on the market canned fish flakes, flaked haddock, minced clams, clam juice, lobster, finnan haddie, and a variety of other fish. Canned fish may be used in any recipe which calls for cooked fish. A wide variety of frozen fish including steaks, fillets and "sticks" as well as whole fish, shellfish, and lobster tails make fish of high quality available in all parts of the country.

The shellfish such as oysters, clams, and mussels have rather well-developed connective tissue which is toughened by intense heat. They require cooking precautions resembling those taken with beef, veal, and similar meats. Shellfish are cooked by many of the same methods used for other fish. They are rather widely used as the first course at a dinner or luncheon, usually in the form of cocktails. They are also popular in bisque, chowder, stew, soup, and salad. Shellfish if fresh and unpolluted are a desirable food. Fresh, frozen and canned, they may add pleasing variety to the daily menus.

ACTIVITIES

1. Prepare different cuts of beef by suitable methods, selecting from among the following:
   - Beef stew
   - Braised chuck steak
   - Broiled meat patties
   - Broiled porterhouse steak
   - Cross-arm pot roast
   - Meat loaf
   - Pan broiled T-bone steak
   - Planked sirloin steak
   - Rib roast
   - Spanish steak from round
   - Swiss steak from round
2. Prepare different cuts of veal by suitable methods, selecting from among the following:
   - Breaded veal cutlets
   - Veal birds
   - Veal cutlets
3. Prepare different cuts of lamb by suitable methods, selecting from among the following:
   - Broiled loin chops
   - Crown rib roast
   - Lamb curry
   - Lamb stew
   - Pan broiled rib chops
   - Roast leg of lamb
   - Stuffed cushion shoulder roast
4. Prepare different cuts of pork by suitable methods, selecting from among the following:
   - Baked spare ribs
   - Braised shoulder pork chops

Breaded center loin pork chops
Broiled cured ham
Fresh pork steak baked in milk
Roast pork loin
Stuffed baked rib pork chops

5. Prepare left-over meats, selecting from among the following:
   American chop suey
   Bouchées of meat
   Curry of meat
   Ham timbales
   Italian macaroni
   Meat pie
   Rice à la Creole
   Stuffed peppers
6. Prepare meat sundries, selecting from among the following:
   Baked liver
   Brain cutlets
   Creamed sweetbreads
   Deviled kidney
   Liver and bacon
   Liver loaf
   Scrambled eggs and brains
   Smoked tongue
   Spiced tongue
   Stuffed heart
   Sweetbread cutlets
   Tongue Creole
7. Prepare poultry, selecting from among the following:
   Broiled chicken
   Brown fricassee of chicken
   Chicken à la Maryland
   Fried chicken
   Roast chicken
   White fricassee of chicken
8. Prepare fish and shellfish, selecting from among the following:
   Baked fillet of fish
   Baked whole fish
   Broiled fish
   Fish timbales
   Fried fish
   Planked fish
   Steamed fish

   } Use fresh or frozen fish

Fish soufflé Salmon loaf Scalloped fish	} Use canned fish

Baked finnan haddie
Broiled lobster
Clam chowder
Creamed salt codfish
Deviled crab
Fried oysters
Lobster à la Newburg
Oyster cocktail
Oyster stew
Scalloped eggs and shrimps
Scalloped oysters
Shrimp wiggle

Refer to *Practical Cookery*, "Fish," pp. 126–132; "Meat," pp. 108–125; "Poultry," pp. 133–139. Heseltine and Dow, *The Basic Cook Book*, "Meat," pp. 178–231; "Poultry and Game," pp. 232–254; "Fish and Shellfish," pp. 255–271.

Recipes for products selected not included in these references are to be supplied by the instructor.

PROBLEM 11 *How shall gelatin dishes be prepared?*

A sparkling, delicate dish of calf's-foot jelly is different from the package of granulated gelatin common in every household, yet the two are similar. The calf's-foot jelly sets because of the gelatin formed from the collagen of the connective tissues, tendons, and bones of the young calf. The gelatin of commerce is made from the cartilage, bones, and skins of domestic animals, approved as food. Gelatin and glue are closely related, both being by-products of the meat industry. Their chief difference is in the degree of purity and the sanitary conditions under which they are manufactured. Gelatin is made under conditions that comply with the pure food laws; glue is made with no attempt to remove the impurities or to maintain satisfactory sanitary conditions.

Dry gelatin ranks with dry farina, wheat flour, and other cereals in caloric value. Unlike these foods, however, practically all the calories are

obtained from protein. However, gelatin composes such a small part of the average diet as to be of little importance from the nutritive standpoint.

Such popularity as gelatin has is due to the fact that it will disperse in hot water and upon cooling form a gel of almost any desired color and shape. It is readily available to bring sparkle and color to the dullest meals. Gelatin is the basis for a wide variety of dishes such as jellies, sponges, and creams used for salads and desserts. It is used in some types of candies such as marshmallows; as an emulsifying agent in certain types of salad dressings; and in ice creams to give body, to aid in keeping the crystals small, and to retard melting. About five million pounds of gelatin are used annually by ice cream plants.

Gelatin is purchased mainly in granulated and pulverized forms. Granulated gelatin, if soaked in cold water, disperses readily in hot water. If unsoaked, it goes into dispersion slowly. Pulverized gelatin is extensively used in the making of many trade gelatin preparations that combine gelatin, sugar, and flavoring. These products do not, for the most part, require soaking in cold water, but disperse readily in hot water.

Uses

Gelatin is used in many salads and desserts. It may be combined with solid foods such as pieces of fruit, vegetables, nuts, or macaroons; with liquids such as fruit juices; or with semi-liquids such as whipped cream, custards, or stiffly beaten egg whites. Gelatin with some liquid acts as a foundation or base and holds solids in position. It causes the liquids and semi-liquids to set, usually making them firm enough to be molded into shapes. A gelatin dish of high quality has good flavor, is attractive in appearance, and is firm without being stiff.

When used in frozen desserts such as ice creams, mousses, and sherbets, gelatin is added in small quantities so as to thicken the mixture slightly and thus improve the texture of the frozen product.

Gelatin dishes are classified according to the ingredients they contain and sometimes according to the preparation of the dish in which they are used. Plain jellies, as the name implies, are the simplest of gelatin dishes, and these form the foundation for many others. They are a combination of gelatin, sugar, and liquid, part of the liquid generally being fruit juices. Fruit or vegetable jellies are made by adding fruits or vegetables which have been shredded or cut into small pieces to the plain jelly. The proportion of gelatin should be increased slightly in such dishes. From the foundation recipe for plain jellies, whips may be made by whipping the mixture just as it is thickening. Sponges are made by folding stiffly

beaten egg whites into the jelly as it thickens. An increase in the proportion of gelatin is desirable in these mixtures also. Bavarian creams are a combination of a gelatin jelly base with whipped cream or milk and fruit. Dishes like Spanish creams often have a custard foundation with egg yolks forming part of the thickening, to which the gelatin is added. Powdered macaroons are sometimes used in such creams. Although Charlotte russes vary widely, they usually have a whipped cream foundation with enough gelatin added to thicken the mixture.

Preparation

In preparing a gelatin dish in which granulated gelatin is used, the first step is complete hydration or swelling of the gelatin in cold water. Hot water is then added to disperse the gelatin. If the hot water added is not sufficient for dispersion, the dish containing it may be set over hot water and stirred until every granule has disappeared.

The proper time for adding the fruit, vegetables, whipped cream, or other ingredients is just as the mixture thickens, previous to the actual setting or gelation. Fruits or vegetables added when the gelatin mixture is still a liquid will often float, leaving a rather thick layer of clear jelly at the bottom of the mold. Adding them after the gelatin has set makes it necessary to break up the jelly and often it will not again form a uniform mass. At about the same thickening stage, whips should be beaten, egg whites added for sponges, and fruit and cream added for Bavarian creams. With charlottes and other dishes in which the proportion of the gelatin mixture is small compared to the proportion of whipped cream or other ingredients to be added, the mixture is allowed to cool but not to thicken. If gelation begins before the combination with whipped cream is completed, it is not possible to obtain a smooth mixture with the gelatin uniformly distributed. This is readily remedied, however, for the gel may be melted or softened over warm water and then added to the whipped cream.

Factors affecting gelation

Various factors affect the gelation of gelatin dispersed in water. One of the chief of these is the concentration of the mixture. Only within certain concentrations will a desirable gel form. With too high a concentration, the gel is too stiff; with too low a concentration, either too soft a gel forms or no gelation occurs. The concentration also determines to an extent the time required for setting. Mixtures of high concentration set in a relatively short time. Those of low concentration take longer. The

Table 38. PROPORTIONS FOR GELATIN DISHES

Type of Dish	Ingredients						Directions
	Gelatin	Cold Water	Hot Water	Other Liquid	Sugar	Other Ingredients	
Plain jellies	1 T.	¼ c.	¾ c.	1 cup { ⅓ c. lemon juice, ⅔ c. water } or { ⅓ c. lemon juice, ⅔ c. orange juice } or 1 c. coffee	½–¾ c.	None	Follow general directions given on page 271.
Whips	1 T.	¼ c.	¾ c.	same as plain jellies			Combine as for plain jellies. Chill until it begins to set. Then whip until it is light and frothy and will hold its shape. Mold if desired.
Fruit jellies	1½ T.	¼ c.	¾ c.	same as plain jellies		Fruits — 1 c. or more.	Combine as for plain jellies. Chill until it begins to set. Then add fruits, mixing thoroughly.
Vegetable jellies	1½ T.	¼ c.	¾ c.	same as plain jellies		Vegetables — 1 c. or more.	Combine as for plain jellies. Chill until it begins to set. Then add vegetables, mixing thoroughly.
Sponges	1½ T.	¼ c.	¾ c.	1 cup { ½ c. lemon juice, ½ c. water } { ¼ c. lemon juice, ¼ c. water, ½ c. orange juice } 1 c. strong coffee { ¾ c. fruit pulp, 2 T. lemon juice }	½–¾ c.	3 egg whites	Combine as for plain jellies. When it begins to thicken beat until frothy, then fold in the egg whites, and continue beating until mixture will hold its shape.
Bavarian creams	2 T.	½ c.	¼ c.	1¼ c. fruit juice or 1½ c. fruit juice and pulp	¾ c.	1½ c. cream or evaporated milk, whipped	Combine as for plain jellies. When it begins to thicken, beat until light, then fold in whipped cream or milk.

acidity of the mixture also affects gelation. Greatly increasing the acidity gives a less firm jelly if the concentration of gelatin remains the same. A very acid mixture, such as sour lemon jelly, requires a higher concentration of gelatin to give the desired stiffening than does a slightly acid mixture. The addition of sugar also affects the gel. A medium amount of sugar increases the stiffness at a given concentration, whereas a large quantity may retard the formation of a gel. A gelatin mixture which stands overnight in a cold place is much firmer than a similar mixture which has stood only a few hours. Temperature goes far toward determining whether or not a gel will form. At 35° C. (95° F.) or above, even mixtures of high concentration will not set. At lower temperatures gelation occurs. Mixtures which form a gel at the intermediate temperatures set more quickly at lower ones. Sometimes use is made of this when it is desirable for a gel to form quickly. In such a case the mixture, instead of being set in a cool place, is packed in ice. It is well to keep in mind, however, that gelatin gels set at low temperatures melt more readily than those formed at higher temperatures. This fact may be especially important if the gelatin dish is to be served in a warm room.

Once a gel has formed it may be warmed to several degrees above the gelation point without melting. However, a great increase in temperature results in the melting of even a well-formed gel. The sol resulting will again form a gel as soon as cooled to a certain temperature without injuring the quality of the product unless it be in the form of a whip, sponge, or cream, in which case there may be some separation of plain jelly.

When gels are to be beaten, it is quite important that the correct amount of gelation shall have occurred, or maximum foam formation will not result. If the gel has become brittle, the increase in volume is much less than if the mixture is just viscous.

Proportions and methods

The relation of gelatin to the liquid should be constant for each class of gelatin dishes. Too much gelatin gives a thick, tough product, unpleasant to the taste. Too little gives a thin mixture which will not mold or hold its shape. Other ingredients may be varied somewhat to suit the taste.

General steps for preparing plain jellies are:

1. Soak the gelatin in a small amount of cold water until it swells.
2. Disperse in hot water.
3. Add other liquid and sugar. Strain if desired.
4. If it is to be molded, pour into a clean mold.
5. Chill thoroughly.

6. Unmold by dipping the mold in *lukewarm* water. Loosen upper edge with sharp-pointed knife. Invert on serving dish. Shake gently if necessary to loosen from the mold.

Service

The tendency for gelatin to melt when it becomes warm necessitates that it always be served cold. Often the arrangement of the food in the gelatin forms a garnish. At other times garnishes of fruit, nuts, or whipped cream may be used.

TABLE 39. POSSIBLE CAUSES OF DIFFICULTY IN THE PREPARATION OF GELATIN DISHES

Difficulty	Cause
Mixture does not harden	Concentration of gelatin too small.
	Gelatin not dispersed completely.
	Mixture not thoroughly chilled.
	Fresh, uncooked pineapple may have been added.*
	Gelatin of low jellying power may have been used.
Mixture too stiff	Proportion of gelatin too great.
	Mixture may be exceedingly cold.
Mixture uneven	Stirred or mixed after mixture began to set.
Fruits or vegetables float	Added before mixture was sufficiently thickened.
Layer of plain jelly in bottom of mold of whips, sponges, or creams	Not whipped long enough.
	Mixture partially melted after whipped.
Mold not sharp cut	Dipped in too warm water when unmolding.
	Gel not stiff enough.

* Fresh pineapple contains a proteolytic enzyme which digests the gelatin sufficiently to destroy its jellying qualities.

ACTIVITIES

1. Prepare various gelatin dishes, selecting from among the following:
   - Lemon jelly
   - Fruit jelly
   - Grapefruit mint jelly
   - Orange whip
   - Cherry whip
   - Marshmallow pudding with chocolate sauce
   - Apricot sponge
   - Raspberry sponge
   - Snow pudding
   - Pineapple bavarian cream
   - Orange bavarian cream

Spanish cream
Ginger cream
Charlotte russe
Burnt-almond Charlotte russe
Uncooked plum pudding
Apricot cream pie
Pumpkin gelatin pie

2. Make plain jellies from different brands of flavored gelatins. Compare as to consistency, color, flavor, and cost.

Refer to *Practical Cookery*, "Gelatin Desserts," pp. 169–172; Heseltine and Dow, *The Basic Cook Book*, "Gelatin Desserts," pp. 518–526.

Recipes for products selected not included in these references are to be supplied by the instructor.

Nuts

Nuts have been regarded as tidbits, a special treat to be added to candy, cakes, or cookies or to be served at parties or special dinners, for so long that it is somewhat difficult to picture them as having the important part in the diet that they might well assume. Many of our ideas about them come from the fact that they are frequently added to an already adequate meal. But served as a substantial part of the main dish, nuts are a valuable addition to the meal.

Striking changes in nut preferences have occurred. Seventy-five or even fifty years ago the favorites were wild nuts, such as hickory nuts and black walnuts. Nuts of this type are hard to crack and pick out, so their popularity declined and the demand increased for shelled or easily shelled nuts.

Of the tree nuts the Persian walnut — which we call "English" because it came to us from England — has long headed the list of favorites. Pecans come next, followed by almonds and filberts. The filbert is a cousin of our wild hazel nut, and a hybrid is being developed which will combine the hardiness of the hazel nut with the size and quality of the European filbert.

Our total supply of tree nuts in 1952 was approximately 700 million pounds. Of these, 400 million pounds were produced in this country and the remainder was imported. This quantity allowed a per capita con-

sumption of 4.4 pounds in the shell or 1.6 pounds shelled. Walnuts were consumed in the greatest quantity with pecans a rather close second. In addition we consumed 0.6 pound of dessicated coconut and 4.4 pounds of peanuts per capita.[1]

The upward trend in the production of three major nut crops is shown by the following table:

TABLE 40. PRODUCTION OF THREE MAJOR NUTS IN THE UNITED STATES *

(In terms of 1000 pounds)

Nuts	1909	1929	1945	1952
English or Persian Walnuts . . .	22,027	86,800	141,800	162,400
Pecans.	9,891	53,340	138,002	147,946
Almonds.	6,794	9,400	47,600	72,800

* Statistical Abstracts of the United States, 1938 and 1946 and Agricultural Statistics 1953. United States Department of Agriculture.

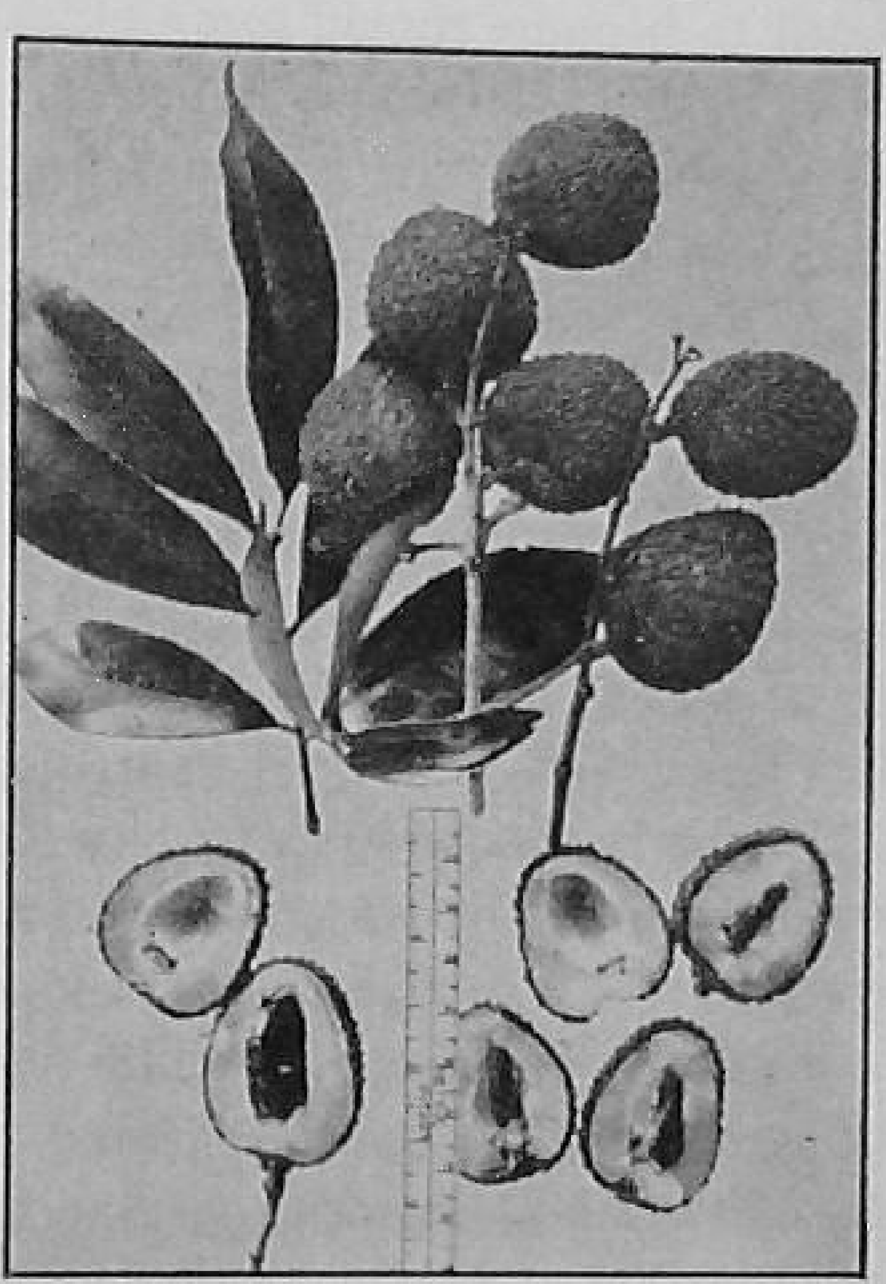
Nutritive value

Nuts are similar to dried beans and peas in nutritive value. They are one of the few foods of vegetable source which contain proteins of high quality, some even being adequate or complete. The protein content of nuts varies from approximately 10 per cent for pecans to 20 per cent for almonds and 26 per cent for peanuts. Few nuts are exceedingly high in carbohydrates, although dried chestnuts and dried litchis are approximately three-fourths carbohydrates. The high fat content of most nuts makes them high-calorie foods. It also limits their use as a source of protein, for such a high fat intake would sometimes be undesirable. A large number of nuts contain in excess of 50 per cent fat with that of pecans being approximately 73 per cent, and of walnuts 64 per cent. Nuts are, on the whole, poor sources of calcium but are much higher in phosphorus and iron. They are low or lacking in vitamin A value and in ascorbic acid. Most of the nuts are classed as excellent sources of thiamine. They also contain riboflavin and niacin although probably none of those commonly used would be considered a good source of riboflavin and only the peanut of niacin. The acceptability of nuts to many peoples, their high food value, and frequently their reasonable cost, make them a desirable food to include in the diet.

[1] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

Characteristics and uses

Peanuts, not truly a nut but a legume, are quite unpalatable raw. Hence they are cooked before serving, usually by roasting, but occasionally by frying, or in a hot syrup, as when making brittles. Many peanuts are used as salted peanuts or in confections, and a large quantity are made into peanut butter. This is made by grinding the roasted, blanched nut from which the germ has been removed. Salt is added during the grinding process. Peanut oil and peanut flour are other products from this legume. Various nut loaves and stuffings contain chopped roasted nuts.



Courtesy of Hawaii Agricultural Experiment Station

Fig. 63

The "litchi nut" is the dried fruit of the litchi; the fruit, foliage and cross section of which are shown here. It bears about the same relationship to the fresh fruit as raisins do to fresh grapes.

Chestnuts, too, require cooking before they are palatable. Fresh chestnuts may be used more or less as a vegetable and may be boiled and puréed, used in stuffings, or roasted.

Cashew nuts are among the leading imported nuts. They grow as a kidney-shaped nut at the distal end of an enlarged fleshy stalk known as the cashew apple. They are roasted to alter the corrosive properties of the fluid between the kernel and the outer shell. They are obtained from various tropical countries at low cost.

Beechnuts, Brazil nuts, butternuts, filberts, hickory nuts, pecans, pine nuts, and walnuts are palatable as taken from the shell, but they may be roasted and salted. Almonds are more acceptable as salted nuts if they are first blanched, then roasted or fried.

Fresh coconuts are imported from the West Indies and Central America. They are used fresh and as shredded coconut. Moist shredded coconut is prepared by finely dividing the meat of ripe coconuts, combining it with sugar and salt, and partially drying the mixture. The coconut is then put into cans, and the cans are exhausted, filled with carbon dioxide, and sealed. The coconut may be further dried for use as desiccated coconut. Coconut is also frozen.

A large portion of the coconuts entering this country come in as copra, a dried form of the meat from which coconut oil is made, though coconut oil is also imported. The apparent consumption of coconut oil in this country in 1952 was more than 165 million pounds.[1]

With the possible exception of cashews, nuts are marketed shelled or unshelled. Shelled nut meats are subject to contamination; hence only those prepared under strictly sanitary conditions are desirable. Moreover, they tend to become rancid more quickly than unshelled nuts, although these too, in time, develop a rancid flavor. Shelled nuts prepared under sanitary conditions have the advantage of requiring little or no time in home preparation, of having no waste, because spoiled ones have been discarded, and of frequently being cheaper, if the edible portion is considered, than the same nut in the shell. Comparing the amount and cost of nut meats obtained each way is an aid in determining whether it is more economical to purchase nuts shelled or unshelled.

Shelled nuts are often packed in tin cans and sterilized; salted nuts may have an antioxidant added after which they may be sealed in cans, jars or bags. Nuts keep best in a cold, dry, dark place away from the air.

In the home, nut meats may be stored in the freezer if they are to be kept through the summer months. If freezer space is not available, the nuts may be stored in sterilized jars from which the air has been exhausted. The jars are sterilized in boiling water, then dried and filled with nut meats of high quality. The lid is placed on the jar, and the jar is partially sealed. It is then set in a container of hot water so that the water comes up about

TABLE 41. QUANTITY OF NUTS TO YIELD ONE POUND OF NUT MEATS

Nut	Amount to give 1 Pound of Nut Meats (Pounds)	Measure of 1 Pound of Nut Meats (Cups)
Almonds	3½	3½
Brazil nuts	2½	3½
Chestnuts	1½	3
Filberts	2¼	3½
Peanuts	1½	3 to 3½
Pecans	2½	3½
Walnuts, black	5½	3 (broken), 4 (halves)
Walnuts, Persian or English	2½	3 (halves)

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

two inches on the sides of the jar. The jar is allowed to stay in boiling water for thirty minutes, then it is sealed, cooled, and stored in a cool, dark place.

In addition to their use as salted nuts and in confections, nuts are used in pastes and butters, in nut loaves, croquettes and stuffings, in nut breads, cakes, and pastry, and in salads, sandwich fillings, and ice cream.

Sugars

Among the myths that portray the life of mankind before authenticated history is one describing the origin of sugar cane that would appeal to the candy lover of modern times. According to a legend from India, where the cultivation of sugar cane has been carried on so long "that the mind of man runneth not to the contrary," the cane was first heavenly food for a temporary paradise. When this paradise was no longer necessary, the sugar cane escaped the general destruction and became common throughout the land, a token of the goodness of one of the gods to mortal man.

Sarkara, the Sanskrit term for sugar cane, has been transplanted with the cane or its product from land to land through the centuries. To the Persian it became *shakar;* to the Greek *sakchar;* to the Latin *saccharum;* to the French *sucre;* and finally to the Anglo-Saxon, *sugar*.

Almost every conquest of ancient and early medieval times resulted in a spread of the knowledge of sugar to new peoples in sometimes widely separated lands. During these times it was regarded first as a medicine, and later as a sweetmeat and a seasoning. Because of its high price, sugar was available only to the wealthy. Even at the time of the discovery of America sugar cost $275.00 per hundredweight. Because of its cost the consumption naturally was limited.

The marked increase in the use of sugar during the last century was emphasized by Mendel some years ago as follows: "During the early part of the last century, sugar was used primarily as a condiment. The consumption in 1823, for example, has been estimated as enough to give each person 8.8 pounds a year. This represents about 44 calories a day. Last year, somewhat more than a century later, the annual per capita consumption of sugar amounted to 108 pounds, or more than 500 calories a day. This means that sugar has become an important food, representing, on the average, nearly one sixth of our energy intake. Incidentally, this has

been accompanied by a tremendous reduction in the cost of the product; 1000 calories are being sold at a retail price of less than 3 cents." [1]

Although the consumption of sugar remains high it has not again reached the level of 108 pounds per person per year mentioned by Mendel. The estimated per capita consumption in 1952 was 96.1 pounds and the cost was almost 6 cents for 1000 calories.

Kinds of sugar

To the average person sugar means cane or beet sugar. A ruling of the Secretary of Agriculture, however, makes it proper to designate corn sugar, glucose, or "cerelose" by the unqualified word "sugar." Fructose, lactose, and maltose are other sugars found rather widely distributed in foods.

Corn sugar is obtained commercially by the hydrolysis of starch with acid. If the process of hydrolysis is stopped when about 50 per cent of the starch is changed to dextrins and 50 per cent to maltose and glucose, corn syrup results. When hydrolysis is complete, glucose is obtained in crystalline form and is marketed as cerelose. Glucose is found naturally in fruits, honey, and certain vegetables.

In natural food substances fructose is likely to be associated with glucose. Glucose and fructose are examples of the simplest kinds of sugars. Honey contains approximately the same amount of fructose as glucose. Fructose is found widely distributed in fruits. This is probably responsible for the name *fruit sugar* which is frequently applied to it. Fructose is today prohibitive in cost. However, it can be obtained from the inulin in the Jerusalem artichoke, and it seems quite possible that some day it may be produced at a cost that will permit its wider use. Sucrose, the most widely used sugar, is composed of a molecule of glucose and one of fructose in chemical combination.

Lactose, a sugar found only in milk, is obtained as a by-product in the manufacture of certain milk products and is used mainly for infant feeding.

Maltose, one of the products of the hydrolysis of starch, is found in corn syrup. It is also prepared from starch by use of the enzyme diastase.

Sucrose

Sucrose is available in large quantities from the sugar cane and the sugar beet. In limited quantities, it is obtained from the sugar maple tree and from certain palm trees. Cane sugar is manufactured from the sugar cane, a perennial grass which grows from eight to twenty-four feet high.

[1] Lafayette B. Mendel, "The Changing Diet of the American People," *The Journal of the American Medical Association*, vol. 99, no. 2, July 9, 1932, pp. 117–120.

In the manufacturing of sugar from sugar cane, the first step is the crushing of the cane to express the juice. The juice is then clarified, usually by heating with lime. The clarified juice is then concentrated in vacuum evaporators to a brownish syrup containing about 35 per cent moisture. Evaporation is continued at low temperatures until a mixture of syrup and crystals called "massecuite, melada, mush sugar or concrete" is obtained. The crystals are separated from the liquor or molasses by centrifugal machines. The molasses may be evaporated a second and a third time and the crystals removed. The sugar thus separated from the molasses is known as raw sugar. The raw sugar must be washed, redissolved, treated with lime, filtered, recrystalized, washed and dried to give the familiar refined sugar.

Improved methods of purification are constantly being tried in order that the process from cane to sugar may be reduced. One such method is the ion exchange process whereby impurities are removed and the juice yields a pure white sugar and edible syrup upon evaporation.

Beet sugar is made from sugar beets, which now are grown extensively in the west central portion of the United States. Although the Chinese even in ancient times made a crude sugar from beets, these were not used commercially in the western hemisphere until 1801, when a factory was opened in France. Nine years later an award of one million francs offered by Napoleon for the best method for the manipulation of beet sugar gave a great impetus to its use. But not until 1880 were the cultivation of beets and the manufacture of beet sugar undertaken in the United States. To-day the sugar beet may contain from 16 to 20 per cent sucrose, three times that found in the beet in Napoleon's time.

The beet juice, which is high in sucrose, is leached from the washed, sliced beets by hot water. It is then subjected to clarification, filtration, and evaporation, and to processes of purification and concentration, resulting in the formation of clear crystals.

The formation of crystals in the making of either cane or beet sugar is one of the most important steps. Too fine crystals result in too great a loss of sugar in the syrup. Too large crystals do not find a ready sale. Stirring makes for the formation of a larger number of small crystals. Crystals, if allowed to form without stirring, may grow to a large size. Rather slow formation over a period of time also permits the formation of large crystals.

Although most cane sugar is highly refined, a small amount is not. This is sold as brown sugar and, depending on the degree of refinement, varies from almost white through various shades of brown to one almost as intense as that of roasted coffee. Light brown and light medium brown

sugars are most frequently found on the market, there apparently being little demand for the dark brown. All beet sugar is refined; the unrefined sugar is bitter and has an odor resembling that of glue.

White sugar is graded as to size of the crystals or granules. Standard or "regular" granulated sugar is for general use. It is variously branded "granulated," "fine granulated" and "extra fine granulated." "Superfine granulated" sugar or "ultra-fine" is a specially screened, uniformly fine-grained sugar designed for special use in cakes, dry mixes and mixed drinks where quick creaming or rapid dissolving is desirable. "Very fine" may indicate an in-between size grain for use in such products as cake-mixes and pudding preparations. "Medium coarse" and "coarse" sugars are also available for special uses. Some granulated sugar is ground or pulverized to give powdered sugar. This is often designated as "XX powdered" if the particles are rather coarse and "XXXX powdered" if they are quite fine. The degree of fineness is indicated by the number of X's.

There is no generally accepted standard for range of particle size in powdered sugars of different designation. However Confectioners' XXXXXX is the very finest and is recommended for sugar fillings in commercial biscuits. It is usually mixed with 3 per cent or more of cornstarch to prevent caking. Confectioners' XXXX is extremely fine and is used chiefly for uncooked frostings and for sprinkling on pies and other pastry. It is often mixed with cornstarch. Standard powdered sugar is not so finely ground as XXXX powdered. It is used by bakers and confectioners where extreme fineness is not important. Coarse powdered sugar is used in the manufacture of jelly powders and for dusting doughnuts and crullers. Cube, loaf, or tablet sugar is made by compressing moist white sugar into the desired shape and then drying.

Homemakers have long believed that cane sugar is superior to beet sugar for such products as candies, frostings, and jellies, but scientific tests show them to yield products of like quality. The size of the crystals and the degree of refinement of the sugar (sucrose), rather than the source seem to be the factors affecting the quality of the product.

Maple sugar is an unrefined sugar produced in such limited quantities that it is of little commercial importance. It is made by the concentration of the sap from the sugar maple tree to the point where crystallization occurs. It has a delightful flavor and is highly prized.

Characteristics of common sugars

The various kinds of sugars, fructose, glucose, lactose, maltose, and sucrose, are alike in that few foods found in the ordinary diet are so highly

refined. For example, cane and beet sugar are 99.9 per cent pure sucrose. All the sugars are energy foods and add neither vitamins, minerals, nor proteins to the diet. These deficiencies are largely responsible for the prejudice shown by certain nutrition workers toward the use of large quantities of sugar in the diet. They do not object so much to the food constituent that sugar adds to the diet as to the constituents that are, in all probability, omitted from the diet when large quantities of sugar are used and to the alleged deleterious effect of such a diet on the teeth.

Sugars vary in both chemical and physical characteristics. These differences are, at least partially, responsible for the difference in their use. In order of solubility, the sugars in pure form rank as follows: fructose, sucrose, maltose, and lactose, the last named being least soluble. This difference in solubility is more noticeable at room temperature (20° C. or 68° F.) than at high temperatures where the rate of solubility of all sugars is greater.

The ease of crystallization of sugars is inversely related to the ease of solubility. Fructose must be present in very high concentration before it crystallizes, and in foods it almost always remains in solution. Even in honey which has crystallized or "sugared," the fructose usually remains in the syrup. Sucrose ranks next to fructose in difficulty of crystallization. Pure glucose crystallizes with relative ease. However, when glucose is combined with another sugar, it not only fails to crystallize but may interfere with the crystallization of the other sugar and may also increase its solubility. Maltose, too, crystallizes readily. If glucose or maltose is used in making jelly, each will crystallize from the jelly. The solubility of lactose is so low that it crystallizes even when present in a rather low concentration. This would greatly limit its use even if it were available at a low cost.

All sugars absorb moisture to a certain extent, so should be stored in a dry place. This ability to absorb moisture is frequently a cause of good keeping quality in food with a high sugar content. Fructose has higher absorptive power than other common sugars. Foods containing fructose, whether added as in honey or molasses, or formed from sucrose by hydrolysis, keep moist longer than foods not containing fructose if other conditions are the same.

The sugars vary greatly in sweetness. Their ranking [1] by several persons tasting solutions is as follows:

[1] Compiled from A. Biester, M. W. Wood, and C. S. Wahlin, "Carbohydrate Studies. I. The Relative Sweetness of Pure Sugars," *American Journal of Physiology*, vol. 73, no. 2, July, 1925, pp. 387–396.

Fructose	173.3
Sucrose	100
Glucose	74.3
Maltose	32.5
Lactose	16

Other studies have been made which give sucrose a value of 100 but give the value of the others as slightly different from that shown in the table. The order remains practically the same, however.

Even though there is a variety of sugars available, sucrose is the one most extensively used. Its sweetness, as will be noted, is considerably greater than that of glucose, which is undoubtedly one factor in its popularity. Its production and manufacture on a large scale have been developed until now it is one of the cheapest sources of calories. However, when one notes the high solubility, the difficulty of crystallization, and the high sweetening value of fructose, it seems that if it ever became available at a reasonable cost it would find wide use.

Properties of sucrose

The extensive use of sucrose in the form of cane or beet sugar seems to justify special consideration of some of its properties. Sucrose is broken down by dilute acid and heat to glucose and fructose. The mixture is frequently called invert sugar. The rate of hydrolysis is affected by the strength of the acid and by the temperature. Some hydrolysis occurs at room temperature, enough so that candy containing acid may continue to soften during long storage. Fondant that is stored for some time before use remains much more plastic when it contains an acid or acid salt than if it is made with sugar and water only. This is a distinct advantage in such candies as chocolate-coated fondant. Molded and dipped while firm, the centers later become creamy. However, the amount of acid which brings this about is sufficient to give the mixture a distinctly acid taste. This may be covered by a fruit flavor such as cherry. Enzymes are also used to hydrolyze sucrose. Enzymes are often added to commercially made fondant to soften it and improve its keeping qualities.

Sucrose heated without the addition of water melts or liquefies. It begins to melt at about 320° F. (160° C.), forming "barley sugar." When heated beyond the melting point, it gives off water, the liquid becomes brown in color, and the sugar is more or less decomposed. A distinct odor is given off, and a new flavor is developed. This process is known as *caramelization*. The resulting substance is often used for coloring and flavoring foods.

Knowledge of the factors influencing the crystallization of sugar is valuable in successful sugar cookery. A solution of sucrose may be rather highly supersaturated before crystallization begins. Even then nuclei are essential for crystal formation. These nuclei may be formed spontaneously from the material in the solution. Particles of dust or bits of other solid substances may hasten crystal formation by acting as nuclei. Stirring and low temperature favor the formation of many small crystals. The concentration of the solution and the temperature at which crystallization begins are also important factors.

Other sweetening agents

In addition to crystalline sugars there are various sweetening agents in liquid form. These generally contain 70 to 80 per cent solids.

Molasses, according to the federal definitions, "is the product left after separating the sugar from massecuite, melada, mush sugar, or concrete and contains not more than 25 per cent water and not more than 5 per cent ash." In other words, molasses is the mother liquor remaining after the crystallization of raw sugar from the concentrated sap of the cane. Because the liquor may be high in sugar after the first crystallization, a second and third crystallization may be made. The industry divides molasses commonly on the market into two grades, "first molasses" and "second molasses," known to the consumer as "light" or table molasses and "dark" or cooking molasses. When a great proportion of the sugar has been removed, the resulting product may be a molasses of strong flavor and such high ash content as to make it an undesirable human food. This is known as "black strap" and is much used for fermentation purposes.

Sorghum syrup somewhat resembles molasses. It is "the syrup obtained by the clarification and concentration of the juice of the sugar sorghum and contains not more than 30 per cent water, nor more than 6.25 per cent of ash calculated on the dry basis." It contains about 36 per cent sucrose, none of which has been crystallized out, and 27 per cent glucose. It has a mild, rather distinctive flavor pleasing to those accustomed to it.

Sorghum, like sugar cane, is a large coarse grass. It is a hardier plant that grows over a much larger area. Steps in the preparation of sorghum syrup are similar to the early steps in the manufacturing of cane sugar. The juice, after being clarified, is evaporated to the desired consistency and then placed in suitable containers, usually tin cans or glass jars. It is made in small quantities in localities where the sorghum is grown, not in large factories. Unlike most sweetening agents, molasses and sorghum

syrup contribute ash to the diet, both being important sources of calcium and iron.

Corn syrup is a product of the partial hydrolysis of cornstarch. It contains a mixture of glucose, maltose, and dextrin. That found on the market frequently contains added coloring, flavoring, or both, because by itself it has only the flavor of sweetness. Corn syrup is sold as such and also as an ingredient in many table syrups. In these it may be combined with sorghum, cane syrup, refiner's syrup, or honey, and may be flavored with butterscotch or vanilla.

"Light," "crystal white," or colorless corn syrup is about 90 per cent corn syrup and 10 per cent sugar syrup. Darker mixtures have refiner's syrup added. The production of corn syrup is really a step in the manufacture of corn sugar. Corn sugar results from the complete hydrolysis of cornstarch followed by the concentration of the solution. The manufacture of corn syrup using enzymes rather than acid to convert the starch to sugar is said to give a product twice as sweet as regular corn syrup and only one-third as viscous.

Maple syrup, no doubt the most popular syrup on the market, is said to be the only native American among them. It is the sap of the sugar maple tree collected in the early spring and concentrated to the desired consistency. Color is important in indicating quality in maple syrup: the lighter the color the better the grade. Cloudiness and "off" flavor may prevent a light colored syrup from being top grade, however. People not familiar with maple syrup may prefer the darker, stronger flavored maple syrups which are made from the last of the run of the sap. These are usually cheaper than the light-colored syrups. Pure maple syrup contains not over 35 per cent water. Mixtures of maple with sugar syrup vary widely, containing as low as about 3 per cent or as high as 50 per cent maple syrup.

Top syrup and cane or sugar cane syrup are obtained by boiling down the whole juice of the sugar cane to a syrup consistency. This syrup has a pungency associated with molasses, but to an expert taster there is also a delicacy and fineness that is lacking in molasses.

Refiner's syrup is a by-product of the refining of the raw cane sugar. The refiner's syrup found on the retail market is mainly in blends with sugar syrup and corn syrup.

Sugar syrup is simply a concentration of sugar and water, and differs materially from the syrups already discussed in that it lacks characteristic color, flavor, and consistency.

Invert sugar syrup is prepared by the hydrolysis of sucrose. Its chief use is in commercial bakeries.

Various other syrups found on the market, such as fruit syrup, malt syrup, and sweet potato syrup, are of comparatively little commercial importance.

Honey is one of the oldest, if not the oldest, known sweet. It is defined as "the nectar and saccharine exudations of plants gathered, modified, and stored by the honey bee." The honey bee sucks nectar from the flowers and swallows it into the honey sac, where certain changes occur. Later it is deposited in a comb where other changes take place. The changing of nectar to honey is known as ripening, and apparently consists largely in removal of part of the water. Honey is high in invert sugar, and, according to the Pure Food Regulations, must contain not more than 8 per cent sucrose and 25 per cent water. It usually contains only about 2 per cent sucrose. The flavor of the honey is largely determined by the source of the nectar. Alfalfa, buckwheat, clover, basswood, and orange blossoms are common sources of honey in America. One usually prefers the flavor to which he is accustomed.

Honey is a highly saturated solution, and upon standing, especially in the cold, it frequently "sugars" or hardens. When it does so, it is known as crystallized honey. This product may be prepared for the market by grinding the crystals that have formed naturally, or the process may be controlled so that crystals of small size may be obtained. This product may be marketed under various names but is frequently called "creamed honey." Honey which "sugars" may be remelted over hot water. High temperatures are likely to injure the delicate flavor. Honey may be purchased in the comb as "comb honey" or "section-comb honey." This is sold in the wooden frames just as it is taken from the hive. "Bulk comb" or "chunk" honey consists of pieces of comb in jars or tin pails with extracted honey poured over them. Honey separated from the comb is known as "extracted" or "strained" honey, depending upon the method of separation used. Extracted honey is removed from the comb by centrifugal force. Strained honey is removed from the broken comb by straining.

Sugar in food preparation

Sugar, although used in foods mainly because of its sweetening power, usually affects the physical characteristics of the product. Sugar toughens the cellulose in such foods as fruits, thus tending to prevent their breaking up or cooking to pieces. It exerts a distinct effect upon batters and doughs. When dissolved, it affects the gluten, too high a proportion causing the product to spread, often running over the sides of the pan. It adds weight to baked products, and if an excess is used or if it is not well dis-

solved, it sometimes gives a "sugary" crust to cakes. It aids materially in the browning of flour mixtures. It tends to prevent the formation of tunnels in muffins and cakes. An excess causes a large absorption of fat in the preparation of doughnuts. Sugar lowers the freezing point of mixtures; therefore an excess should be avoided in frozen desserts. It is an essential ingredient in fruit jellies. In the making of candy it is the ingredient of chief importance.

In sugar cookery, such as candy making, it is important that all crystals be completely dissolved, as otherwise they will form nuclei for the re-formation of large crystals. The sugar solution must be in the right concentration or the finished product will be either too hard or too soft. Also, it is important that sugar harden with the desired crystal formation. When it hardens rather slowly from a moderately supersaturated solution, there is a definite arrangement in the formation of crystals. These crystals may be large or small, depending on the conditions under which they are formed. These are discussed more fully later. In highly supersaturated syrup the sugar hardens without the formation of crystals, giving an amorphous mass such as that in brittles. The presence of large quantities of foreign substances such as butterfat, milk solids, and gelatin prevents the formation of crystals and results in such non-crystalline candies as caramels, butterscotch, and marshmallows.

Although cerelose is not generally available for use in the home, there are indications that it has certain advantages over sucrose for use in food preparation. Cerelose, as corn sugar is designated commercially, is only about four fifths as sweet as sucrose, and hence can be used in larger proportions without giving too sweet a product. In quick breads cerelose is of value in producing a pleasingly brown product as it caramelizes at a lower temperature than sucrose. In yeast breads it supplies a ready food for the yeast. In frozen desserts it slows up crystal formation, giving a smoother dessert but at the same time one which has a lower freezing point.

Syrups also have an important place in food preparation. No other sweetening agent gives quite the same results as molasses in the preparation of such foods as gingerbread, baked beans, Indian pudding, Boston brown bread, and many cakes, cookies, and candies. Sorghum syrup is often substituted, however, in parts of the country where it is produced.

Corn syrup has an important place in the preparation of candies and icings because it helps to retard or prevent the formation of sugar crystals, and it has little if any effect upon the flavor of these products.

Honey possibly deserves wider use in food preparation than it has thus

far had. Because of its high content of fructose, it is effective in controlling crystallization of sucrose in candies and icings. It also absorbs moisture from the atmosphere and greatly enhances the keeping qualities of candies, icings, cakes, cookies, sweet breads, and other similar products to which it is added. But one must always consider the effect of honey upon the flavor of the product. Invert sugar syrup has somewhat the same physical effect without appreciably affecting the flavor. When added to baked foods, it may materially extend the period of "freshness."

PROBLEM 12 *How shall candy and cake frostings be prepared?*

Sugar is extensively used in the preparation of candy and cake frostings. Other sweetening agents, such as molasses, sorghum, and a variety of syrups, are used to a limited extent.

Candies are divided roughly into two classes, creamy or crystalline, and amorphous or noncrystalline. To the first class belong fondant, fudge, penuche, divinity, sea-foam, and other candies which have a distinct crystalline structure. To the second class belong caramels, butterscotch, lollipops, marshmallows, and gumdrops. In amorphous or noncrystalline candies, sometimes referred to as "solid liquid," the mass hardens or sets with no formation of crystals.

The type of candy made is determined by (1) ingredients used, (2) degree of cooking or concentration, and (3) manipulation after cooking.

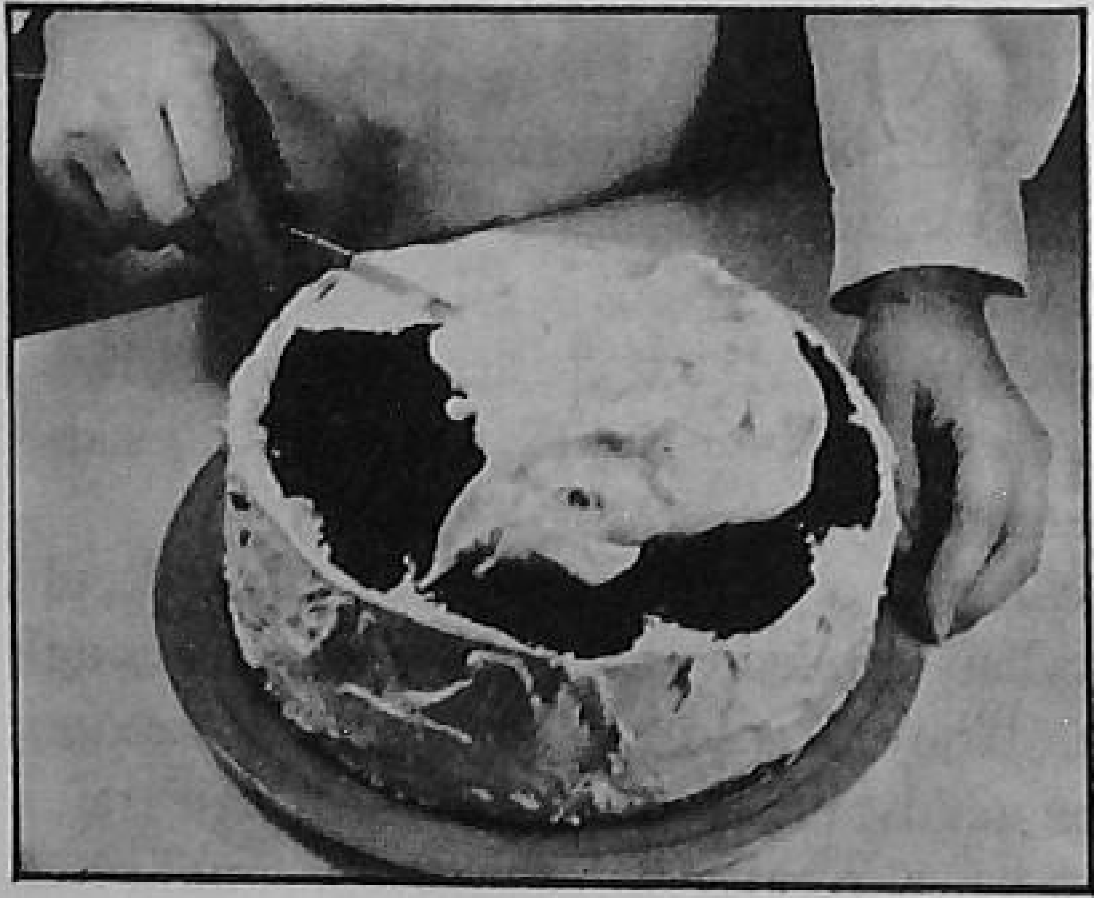
Sugar or some substance high in sugar is the basis of all common candies. Other ingredients added affect the flavor and the texture. Chocolate, nuts, and flavoring materials alter the flavor. Practically all solids which dissolve or mix intimately with the sugar syrup alter the texture.

Cake frostings resemble the creamy or crystalline candies. They should be soft enough to spread readily when applied to the cake but firm enough so they do not run off the cake. They should remain soft and creamy during the time the cake remains good to eat. Factors which determine the quality of creamy candies, as a rule, also determine the quality of

Fig. 64

To frost a cake with seven-minute icing, cut a circle one inch smaller than cake from waxed paper. Place paper from which circle has been cut on plate. Place layer of cake on plate leaving waxed paper overlap around cake. To frost, spoon frosting around cake layer. Spread with flexible spatula.

Spoon on more frosting and cover top of first layer. Place second layer over bottom layer. Add more frosting and spread evenly over sides of cake. Use scissors to slit waxed paper on four sides. Pull out paper carefully from under cake.



For a pretty topping for cake place spoonfuls of icing around cake and spread it carefully to the edges. Not a cake crumb should show. When top is covered, add more frosting and use spatula to make swirls.

Courtesy of Swift and Co.

cake frostings, therefore the following discussion although primarily concerned with candy making is largely applicable to the making of frostings.

Crystal formation

In the making of crystalline candies the chief concern is to control conditions so that the recrystallization of the sucrose takes place in such a manner that the crystals formed are so small that they can be seen only by the aid of the microscope.

Fondant, the simplest of the crystalline candies, may be made from sugar and water only, though there is much less danger of failure when corn syrup or an acid, usually cream of tartar, is added. Corn syrup contains various substances which interfere with the formation of crystals. Acid inverts or hydrolyzes the sugar to invert sugar, which also tends to prevent or delay crystallization. Too much of either corn syrup or invert sugar tends to prevent crystallization entirely; hence excess must be avoided in fondant making. The amount of corn syrup added may be definitely controlled, but the amount of invert sugar formed by acid varies with many factors. These include (1) the amount of acid added, (2) the amount of water used, (3) the alkalinity of the water, (4) the temperature at which boiling begins, and (5) the rate or length of cooking. The formation of about 6 per cent of invert sugar is generally considered sufficient to produce small crystals in fondant but does not result in an undesirable flavor.

Even though it is more difficult to control the amount of invert sugar formed in such a solution, fondant containing cream of tartar is often considered more desirable than that containing corn syrup. The fondant is more nearly white in color, it is often more creamy, and it remains moist for a longer time. The invert sugar contains fructose, a simple sugar, that has the property of absorbing moisture from the air. If too much moisture is absorbed the mixture becomes sticky and difficult to handle. This, of course, is undesirable. Cream of tartar affects the flavor of the candy slightly. This to some is undesirable, but to many it is quite pleasing.

Fondant containing neither corn syrup nor acid is not only more difficult to make but has, as a rule, a shorter shelf life. That is, the sugar crystals become larger and hence the fondant becomes grainy in a shorter time. The crystals in fondant are separated from each other by a highly concentrated syrup. If the syrup contains only sucrose it does not interfere with crystallization. If corn syrup or invert sugar is present, the syrup is much more viscous, making it more difficult for the crystals to grow rapidly.

The inclusion in candies of such other ingredients as butter, cream, milk,

gelatin, egg whites, and similar substances aids in the separation of the sugar crystals and helps keep the candy creamy.

Amorphous or noncrystalline candies, as the term implies, have no crystal formation. The use of large quantities of substances such as corn syrup, acid, milk, and gelatin, which interfere with crystal formation, tends to prevent all crystallization.

In the making of candy, properly cooked syrup is entirely free from crystals. That is, the sugar is completely dissolved. This is important because any crystals that remained would tend to act as nuclei for the formation of larger crystals from the supersaturated syrup. It is sometimes necessary to wash the sides of the kettle off with a damp cloth or to cover the kettle with a lid for a short time to melt the crystals by steam while cooking. Whether or not the syrup is stirred depends upon the ingredients used and the concentration to which it is cooked. Candy with a high content of milk solids tends to scorch readily, so usually requires rather continual stirring. Fully dissolved solutions composed mainly of sugar and water require little or no stirring.

Stages of sugar cookery

Reducing the sugar mixtures to just the right concentration is important if candy of the desired consistency is to result. The stages of sugar cookery are frequently designated as thread, soft ball, firm ball, hard ball, soft crack, and caramel. Each stage is reached at approximately a given temperature, as indicated in Table 42.

Differences in atmospheric pressure due to altitude or weather affect these temperatures. The temperature at which the soft ball stage is reached in Missouri at an altitude of 700 feet is given as 113° C. (235° F.), in Idaho at 2700 feet as 110° C. (230° F.), and in Colorado at 5347 feet as 106° C. (223° F.). Substances other than sucrose in the solution may change the temperature required to obtain a given consistency in a mixture. The use of cream of tartar in making fondant results in smaller molecules in the solution in proportion as inversion occurs. This raises the temperature of the mixture required for a given consistency. Corn syrup with molecules larger than those of sugar has the opposite effect. Hence, any one of the stages of sugar cookery may vary by a few degrees because of the effect of ingredients. Temperature can be relied upon entirely only when the identical substances are used in the same proportion, under identical conditions. Weather, often disregarded as an influential factor in cookery, may prevent an ideal product. On damp, rainy days, concentrated sugar solutions, with their high affinity for moisture, may be softer

Table 42. STAGES OF SUGAR COOKERY*

Stage	Temperature at Sea Level, Sugar and Water Mixture		Description
	Degrees F.	Degrees C.	
Thread.......	230–235	110–113	Mixture will spin a 2-inch thread when dropped from a fork or spoon.
Soft ball......	235–240	113–116	Mixture will form a soft ball, but loses its shape when removed from the cold water.
Firm ball......	246–250	119–121	Mixture will form a firm ball in cold water.
Hard ball.....	250–265	121–129	Mixture will form a hard ball in cold water.
Soft crack.....	270–290	132–143	Mixture will separate into threads when it strikes the cold water and will crack or break when crushed between the fingers.
Hard crack....	300–310	149–154	Mixture is very brittle and will not stick to the teeth.
Caramel......	350	177	Mixture passes the hard crack stage and begins to brown.

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than those produced on bright, dry days, even though all other conditions are the same.

In using the thermometer to determine the concentration of the sugar mixture, the bulb of the thermometer should be completely immersed in the boiling liquid, but it should not rest on the bottom of the utensil. Candy thermometers are sometimes marked to indicate the depth to which they should be immersed in the syrup. Readings should be made with the eye at a right angle to the upper level of the mercury in the thermometer.

The stages of sugar cookery, as tested in cold water, are difficult to determine because there is no sharp dividing line between them. There is no exact concentration at which a soft ball becomes firm. Distinction be-

tween these stages is a matter of personal experience, and even for the same individual, difference in the temperature of the water in which the sample is tested may give considerable variation. The water should always be cold for this test, and it should be at the same temperature for successive tests. A given syrup forms a softer ball in warm water than in cold. In making the cold water test, it is best to use a shallow bowl rather than a cup. It is easier to see how the syrup acts in the cold water and also easier to pick up the ball.

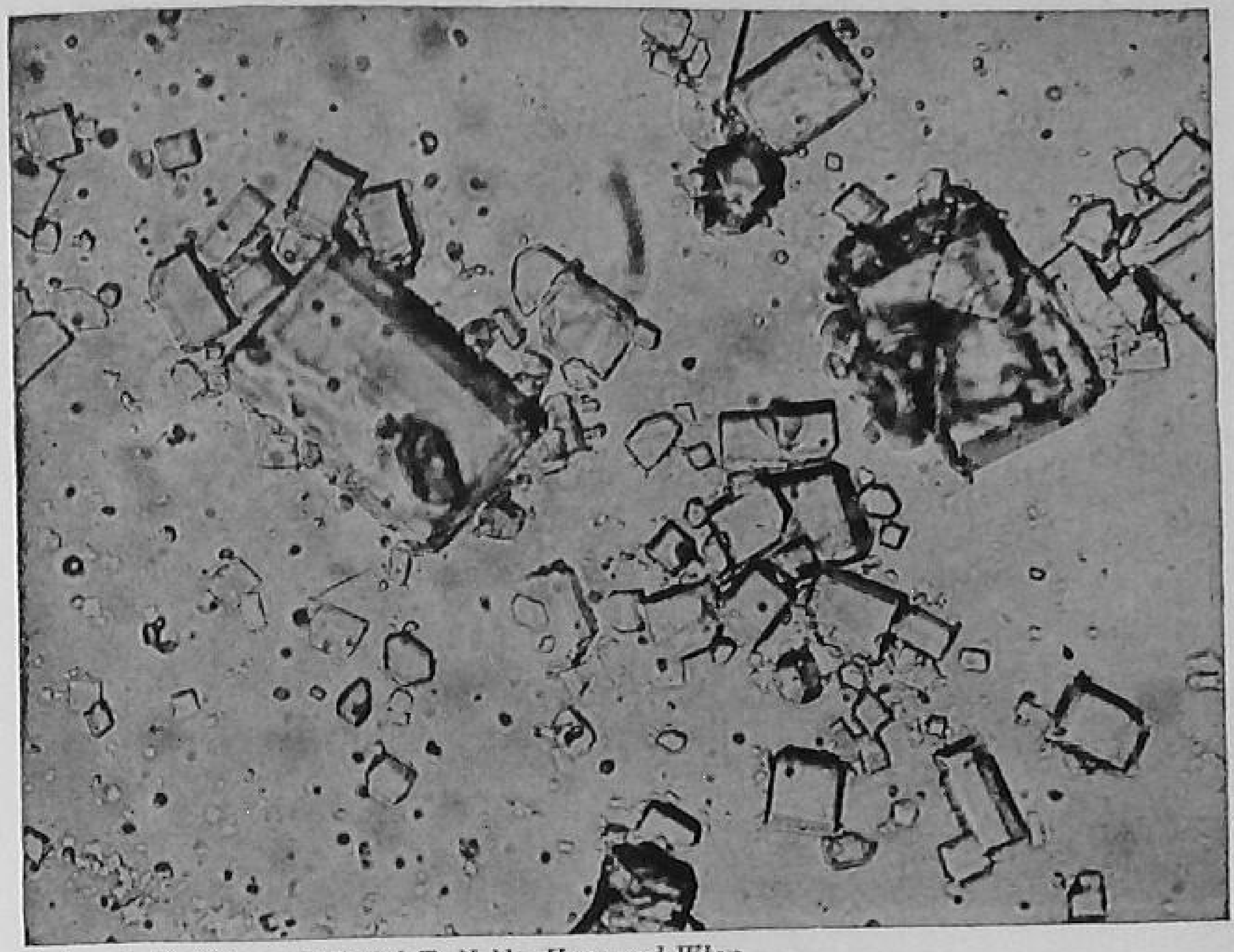
Beating

Manipulation after cooking has a decided effect upon the candy. Crystalline candies are beaten. To make small crystals it is necessary to stir apart or separate the crystals as fast as they are formed, otherwise they grow together, and large crystals result. The necessary rate of stirring depends upon the rate of crystal formation. If in making fondant and similar candies, the hot syrup is beaten as soon as removed from the heat, the crystals form so rapidly that it is almost impossible to separate them, and crystals of large size are the result. The syrup should be allowed to cool to at least 60° C. (140° F.). As the syrup cools it becomes proportionately thicker and more viscous. In the thicker syrup the crystals form with greater difficulty, and since they are separated by a solution through which they travel slowly, they are rather small in size. Fondant beaten at 40° C. (104° F.) is finer in grain than when beating is started at 60° C. (140° F.). The latter temperature, even though it gives a slightly coarser grain, is frequently used because of the shorter time of beating.

Beating until all the crystals are formed is also essential for a good texture. Before the candy is beaten, it is viscous, shiny, and smooth. Afterwards, as the crystals begin to form, heat is given off, and the mixture becomes warmer and thinner. With further beating it cools, stiffens rapidly, and becomes creamy, dull, and lighter in color as crystallization is completed. Kneading, often done after the mixture has thickened, insures working of the mass until crystallization is complete and results in a more creamy consistency than is obtained with less manipulation.

Fondant

Fondant, unlike most other candies, is seldom ready for use when it has been kneaded. A ripening period of from twelve to twenty-four hours makes it more plastic and easier to handle. Fondant is used as a foundation for mints, bonbons, chocolate creams, and many other candies. Attractive mints are made by melting fondant and shaping it into patties.



Evelyn G. Halliday and Isabel T. Noble, Hows and Whys of Cooking, Courtesy of The University of Chicago Press

Fig. 65

Sugar crystals in fondant are large when the syrup is beaten while hot (103° C. or 217° F.).

About one cup of fondant can be melted at a time. If more than this is used there is danger that the last will be "grainy" because of the constant dipping in and out. When less is used, it must be reheated frequently, and the evaporation is proportionately greater.

Fondant may be flavored with peppermint, spearmint, wintergreen, or other flavors as desired, and may be colored if one wishes. Both the flavoring and coloring, if desired, should be added in small quantities with care. The fondant should be placed in the top of a double boiler for melting. If the fondant is in one piece it may need to be turned occasionally to hasten melting. If it does not melt readily, adding a few drops of water will be an aid. When melted, the fondant is removed from the heat and dropped from the tip of a teaspoon onto oiled paper spread on a smooth surface. Stirring or dipping more than is necessary should be avoided as large crystals may form, causing white spots on the mints. Great extremes in temperature are also said to cause white spots, so it is best not to cool too rapidly. After a few mints are made, the spoon becomes coated

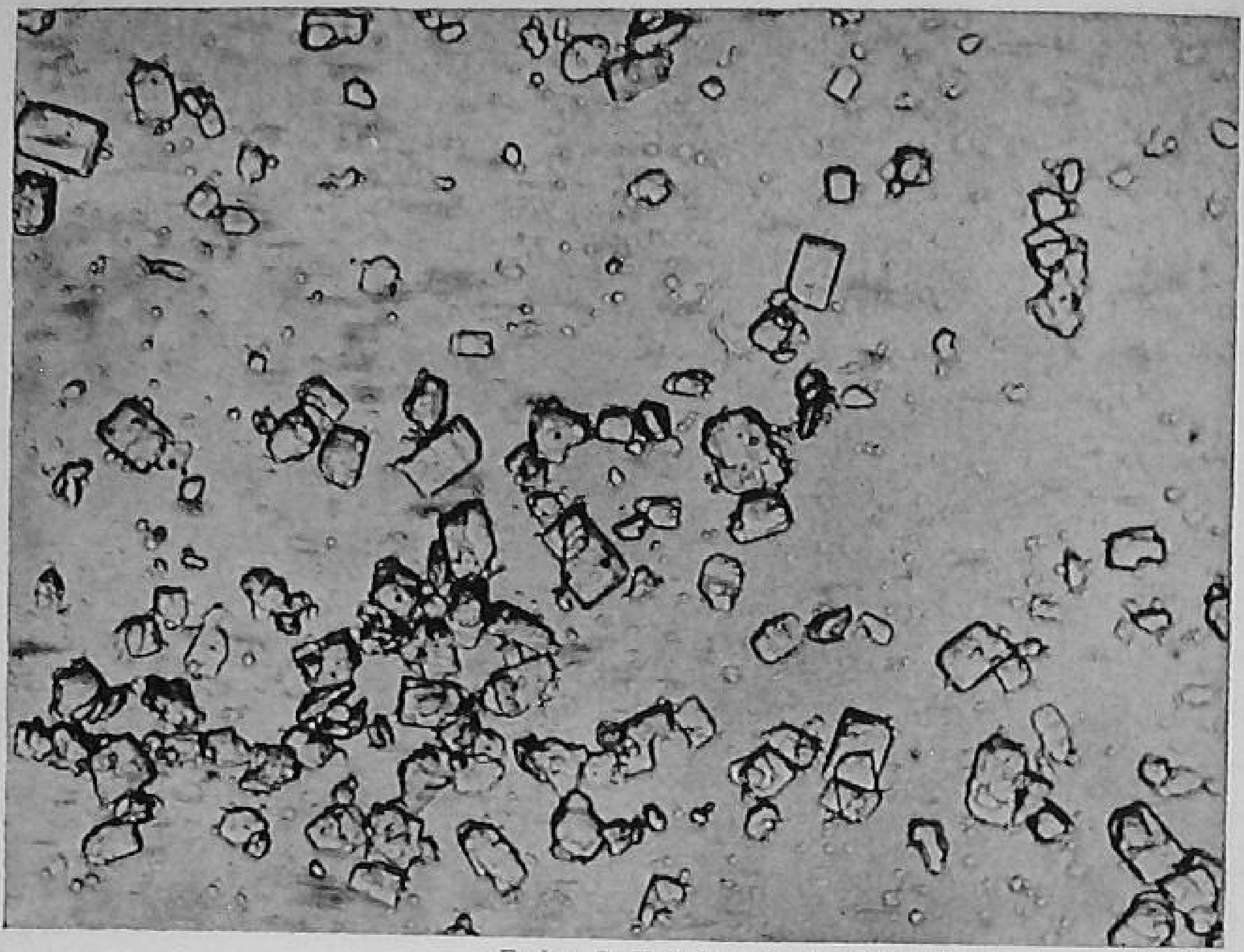


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Fig. 66

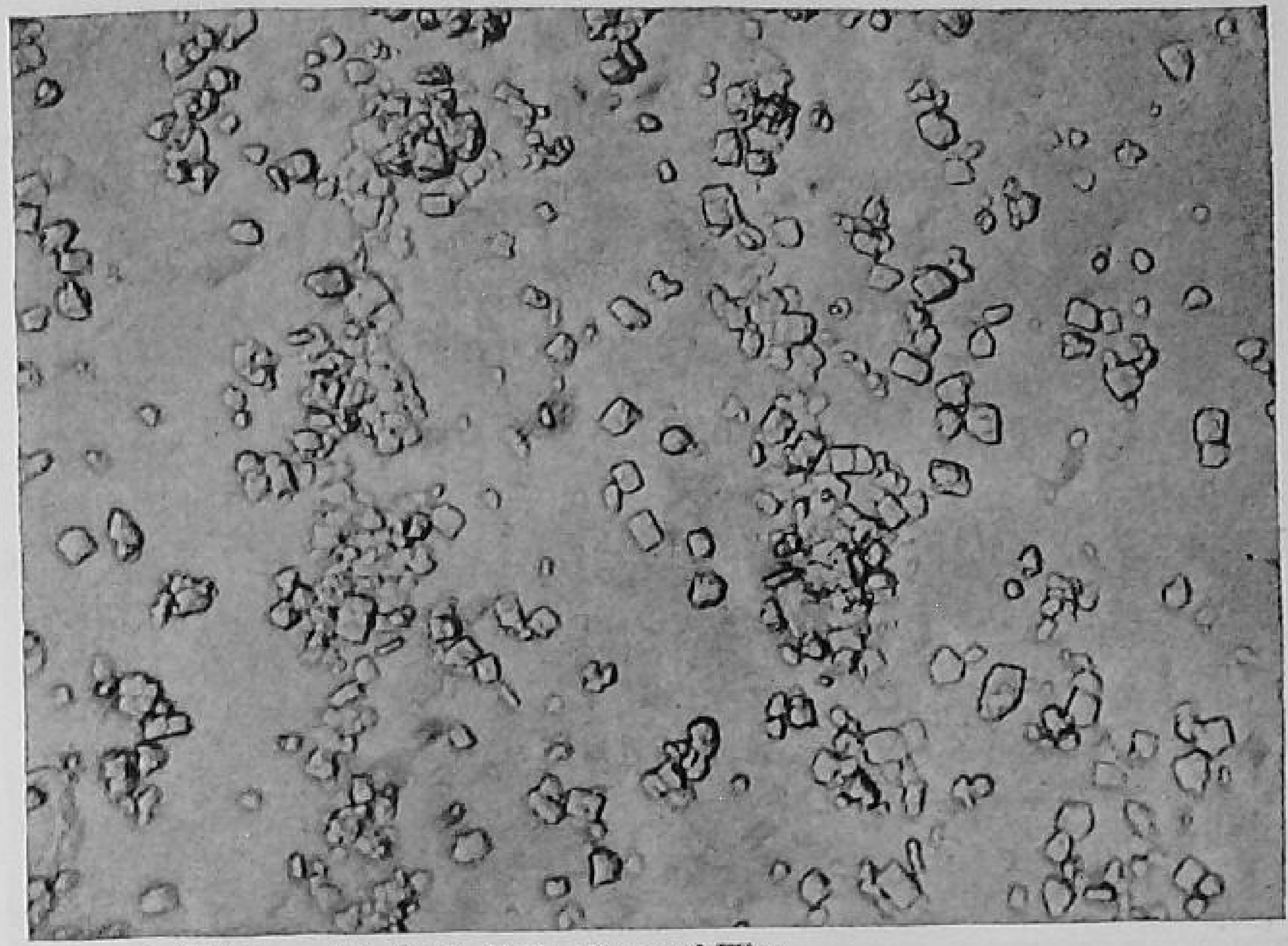
Medium-sized crystals form in fondant when the syrup is beaten at 60° C. (140° F.).

with hard fondant. This should be scraped off into another container for later use.

Mints may also be made by shaping the ripened fondant with the fingers. When this is done, the flavoring is worked into the fondant, and it is then shaped. Centers for bonbons and chocolate creams are usually shaped without heating. Bonbons are made by dipping centers of fondant, or of many other kinds of candy, into fondant which is melted as for making mints. Center and outer coating may or may not be colored and flavored. Fondant is widely used in the making of chocolates. Shaped centers, which have been allowed to harden slightly, are coated with "dipping chocolate." This is best done when the melted chocolate is held at a temperature of approximately 29° C. (85° F.). The correct temperature of the chocolate is important if the results are to be satisfactory.

Other types of candy

Candies of which the taffies are typical are pulled. These may or may not become creamy. Such candies made with sugar usually have vinegar,



Evelyn G. Halliday and Isabel T. Noble, Hows and Whys of Cooking, Courtesy of The University of Chicago Press

Fig. 67

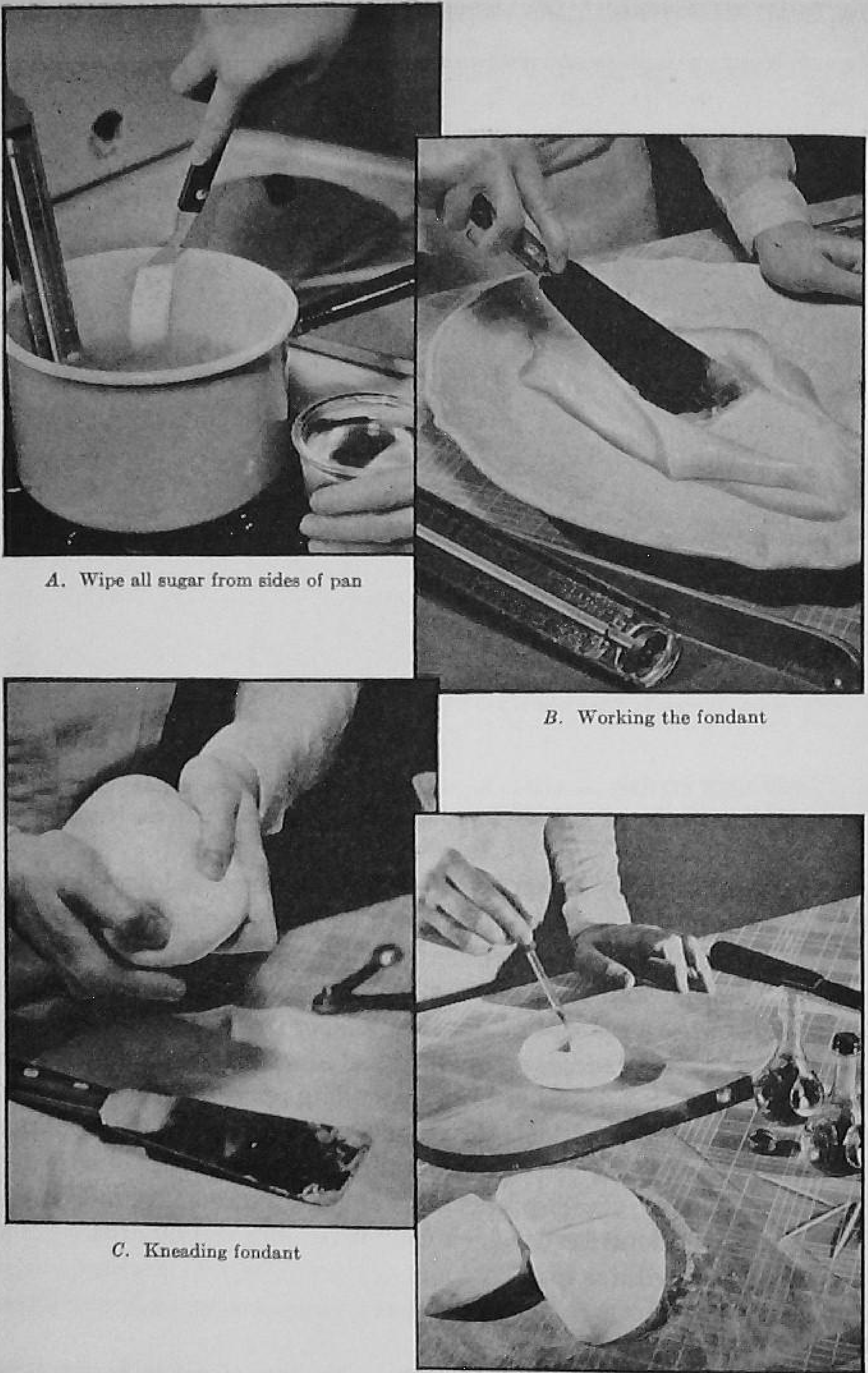
Small sugar crystals are highly desirable in fondant. These are obtained when the syrup is beaten at 40° C. (140° F.) or when it feels just warm to the hand.

lemon juice, or cream of tartar added so that considerable inversion occurs. Other candies of this class are made with large proportions of corn syrup, molasses, or sorghum and may even have no sugar added.

Noncrystalline candies as a class are not worked after being cooked. Marshmallows are an exception, for they are beaten to make a foam. Most other noncrystalline candies are molded and allowed to cool, at which time they harden, the degree of hardness depending upon the concentration to which the mixture was cooked. Caramels, which are one of the most popular candies of this class, usually have rather large quantities of corn syrup or molasses added. Large proportions of milk and cream are also used. These give a delicious flavor which cannot be obtained otherwise. Their preparation necessitates long cooking.

Uncooked candies

The use of confectioners sugar as the main ingredient in fondant- and fudge-type candies is becoming increasingly common. The sugar may be combined with butter or other fat, cream, egg, water, fruit juice, con-



A. Wipe all sugar from sides of pan

B. Working the fondant

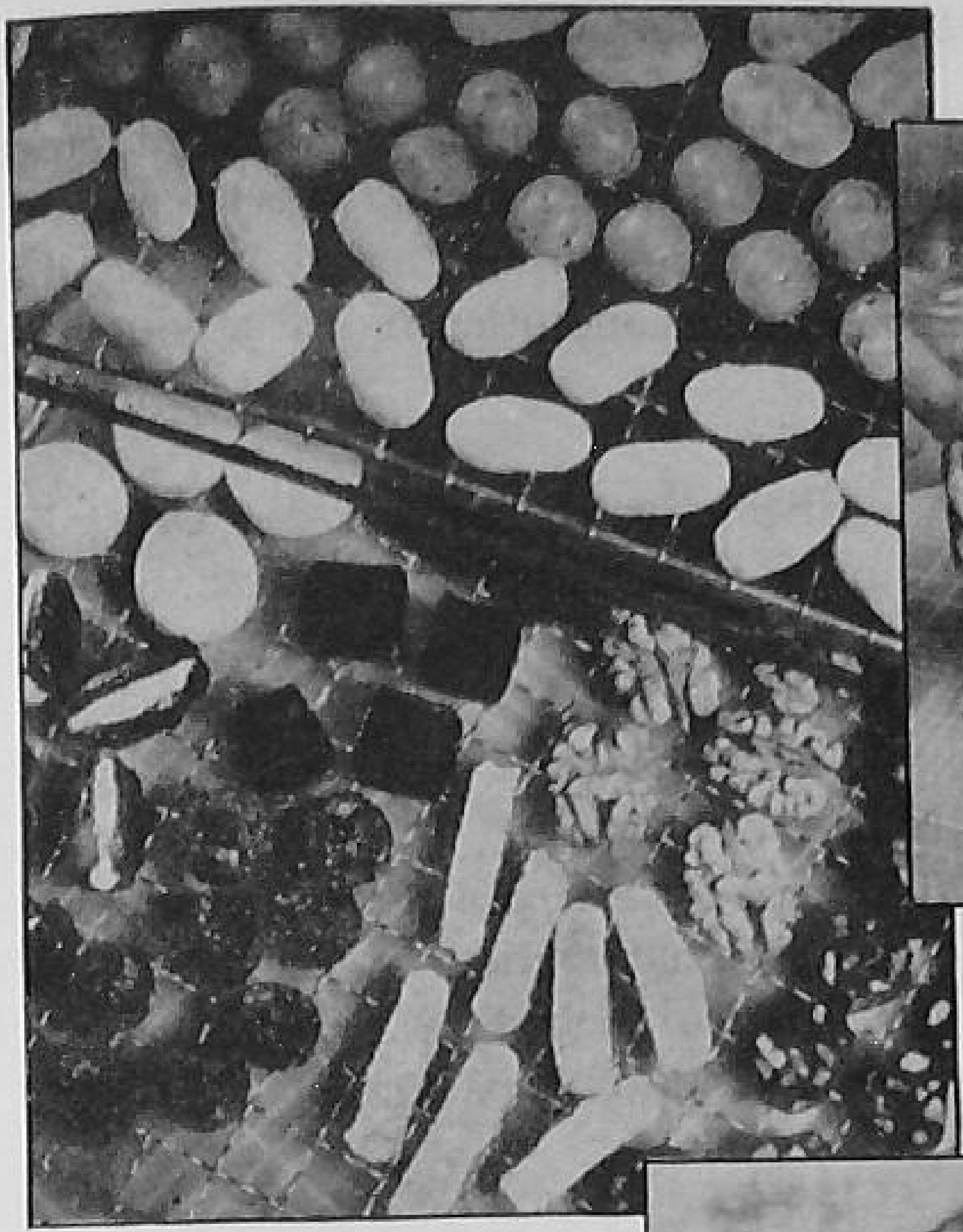
C. Kneading fondant

D. Adding flavors and colors to fondant

Fig. 68

Fondant is a favorite center for chocolates made in the home or laboratory.

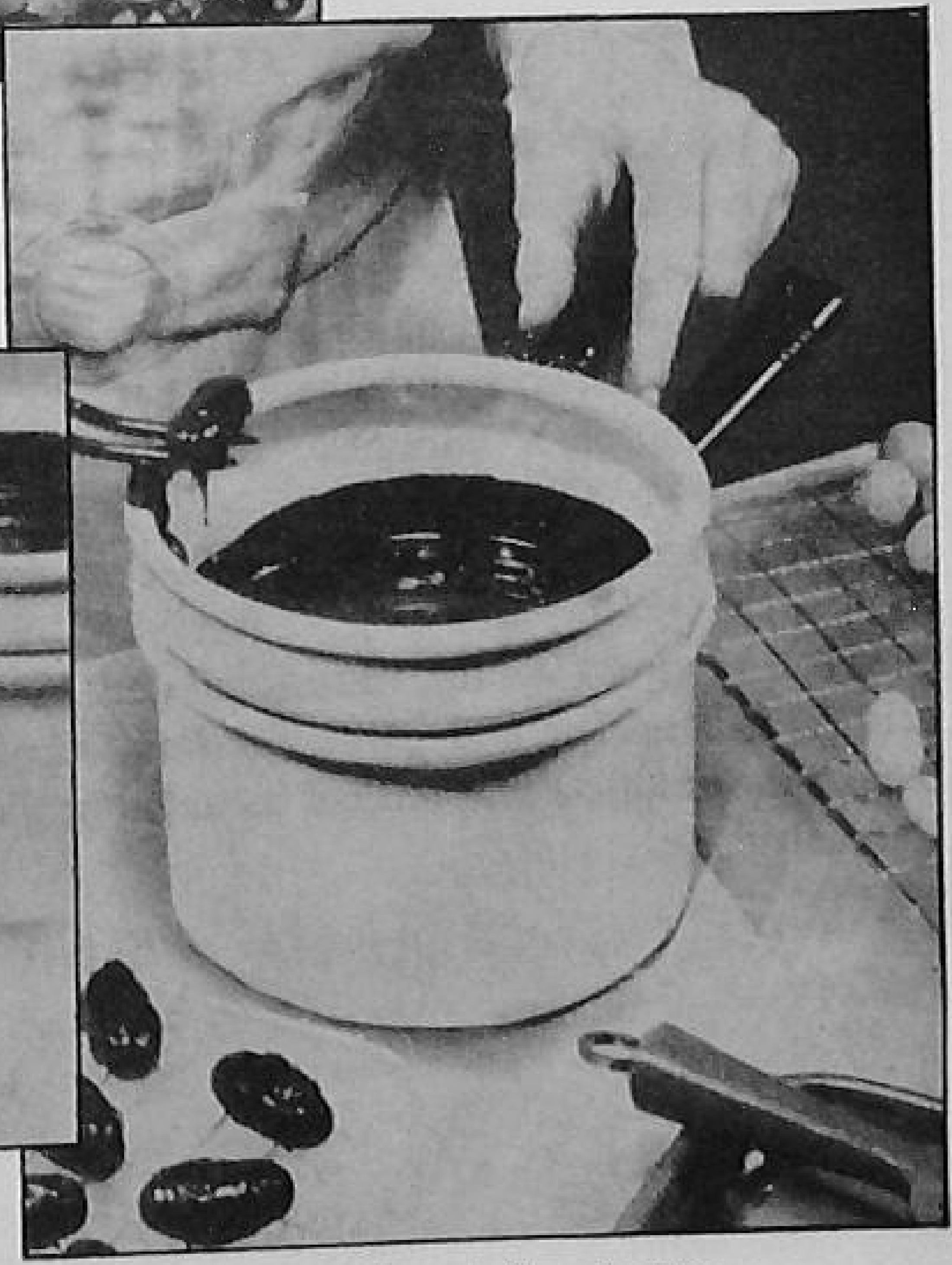
Courtesy of Walter Baker's Dot Chocolate



A. An assortment of centers

B. Testing the temperature of chocolate

D. A twist of the fork forms a string on the chocolate



C. Lifting out dipped center

Fig. 69

Chocolates with a variety of centers are the pride of every amateur candy-maker.

Courtesy of Walter Baker's Dot Chocolate

densed milk, or other foods and a variety of flavorings. When fat, cream, condensed milk, or similar substances are used, the candy may remain soft and creamy for some time. Uncooked frostings are easy to make and are extensively used for cakes, cookies, breads and other baked products.

Characteristics

Different types of candies have distinctive characteristics. Crystalline candies such as fondant are creamy, smooth, and of fine texture. Crystals should be formed, but they should be so small that they cannot be felt on the tongue, and the candy should feel velvety. The crystals should remain small so that the candy may be kept for a time. Candies should be of a color in keeping with the ingredients used. The flavors should be well blended and of high quality. Noncrystalline candies should be free from crystals, for if crystals form, their characteristic consistency is lost. These candies should be firm enough to hold their shape. Caramels should be "chewy," marshmallows "spongy," and lollipops hard.

ACTIVITIES

1. Prepare fondant. Let it ripen until the next laboratory period, then flavor and shape it as desired.
2. Make other typical creamy candies such as chocolate fudge, penuche, divinity, nougat, sour cream fudge, and pralines.
3. Make typical noncrystalline candies such as nut brittle, peanut brittle, butterscotch, chocolate caramels, marshmallows, vanilla caramels, lollipops, molasses taffy, and toffee.
4. Prepare glazed fruits and nuts, candied orange peel, and spiced nuts.

Refer to *Practical Cookery*, "Frostings and Fillings," pp. 194–197; "Candies," pp. 217–227; Heseltine and Dow, *The Basic Cook Book*, pp. 579–594.

Recipes for products selected not included in these references are to be supplied by the instructor.

PROBLEM 13 *How shall frozen desserts be prepared?*

Among the numerous frozen desserts, perhaps the most common are plain ices, sherbets, and ice creams. However, frozen products elaborately molded and designed are now prepared and used on numerous occasions to carry out a novel idea or to express the spirit of a season.

Frozen desserts are all crystalline mixtures. In this respect they resemble creamy candies, the difference being that in the one, ice crystals are responsible for the nature of the product; and in the other, sugar crystals. Many of the same factors involved in the making of candy apply to the making of frozen desserts. The nature of the ingredients, the rate of crystal formation, and the rate and amount of stirring in both cases affect the character of the product.

It is difficult to classify frozen desserts definitely, because of lack of uniformity in ingredients used and method of making. Almost every writer gives a slightly different classification. However, on the basis of ingredients often used and methods commonly followed, including the method of freezing, they may be classified as follows: (1) those stirred during the freezing process: Ice, frappé, granite, punch, sherbet, sorbet, lacto, soufflé, and ice cream; and (2) those frozen without stirring: Mousse, parfait, ice cream, ice, frappé, granite, and sherbet.

In the first group is ice, which consists of fruit juice, sweetened with sugar, diluted with water, and frozen; frappé, an ice frozen to a mushy consistency, and served in that form; granite, an ice frozen with little stirring, so that it is rough and icy; punch, an ice containing highly spiced fruit juices, though originally alcoholic liquor was used instead of fruit juices; sherbet, an ice with egg white or gelatin added or with milk or cream substituted for water; sorbet, a sherbet with a combination of fruit juices; lacto, a sherbet with sour milk; soufflé, a sherbet with egg yolks added. The kinds of ice creams vary greatly. Plain or Philadelphia ice cream is generally considered to be thin cream, sweetened, flavored, and frozen. This may or may not contain a binder or stabilizer such as gelatin. Commercially made ice cream which contains sufficient egg yolk to be yellow in color is sometimes referred to as parfait or New York ice cream. When

made in the home, such a mixture is often called French ice cream. When fewer eggs are used or when eggs and flour or cornstarch are the thickening agents, it may be called American ice cream. Those containing egg, regardless of proportion, are also called custard ice creams and are widely made in the home. Apparently this term is used even when the egg mixture is not cooked.

In the group of desserts not stirred while freezing are mousses made of whipped cream, sweetened, flavored, molded, and frozen; parfaits made of beaten eggs or egg whites cooked by pouring hot syrup over them with whipped cream added and frozen; frozen fruits or fruit pulp, sweetened and frozen. Many of the desserts listed under the group of those "stirred during the freezing process" are frozen in mechanical refrigerators and, although not stirred during freezing, they are removed from the refrigerator and beaten thoroughly one or more times during the freezing process. These desserts differ from those stirred while freezing in that they frequently have whipped cream, whipped milk, or stiffly beaten egg white added, and they are all likely to contain a relatively large amount of one or more binders or stabilizers.

In frozen desserts the mixture is generally frozen by the absorption of heat by the melting ice. When ice melts, heat is absorbed from materials near or in contact with the ice. But this action must be aided if foods are to be frozen. Even water does not freeze when packed in ice alone. Some substance is essential to lower the temperature below the melting point of ice. Salt when added to ice dissolves in the film of water on the surface of the ice. The dissolved salt depresses the freezing point of the brine and thus produces a lower temperature. Within limits, the proportion of salt added to the ice determines the temperature obtained. A higher proportion of salt results in a lower temperature, if other conditions remain the same. Also, salt which can be evenly distributed throughout the ice tends to lower the temperature more rapidly. There is an advantage in using rock salt rather than fine salt, as the latter tends to lump readily. If the ice is in small pieces so that more surface is exposed, it melts faster and the low temperature is reached more quickly.

Factors affecting the product

Ingredients are perhaps of first importance among the factors affecting the character of the product. A combination of water, sugar, and flavoring is exceedingly simple and tends to be much more icy than one containing more solids which aid in separating the ice crystals more widely. Generally, the more solids used, the more completely the crystals are separated, and the finer the texture will be. Cream is generally conceded to be one

of the most desirable ingredients in ice cream. The fat is held in an emulsified form, and the cream can be whipped to include considerable air, which is an important factor in obtaining a smooth product. Other solids or stabilizers of greater or lesser efficiency are milk solids added either as whole, evaporated, condensed, or dried milk, eggs, both whites and yolks, cooked starches, gelatin, gums of different kinds, pectin, corn syrup, sodium caseinate, and sodium alginate. Rennet also seems to be effective in giving body to the dessert. The solids make the mixture more viscous and thus allow the incorporation of more air. When the ice crystals form in such a mixture they are small and tend to stay small, as both the solids and the air aid in keeping them apart. As a rule, the use of only a moderately rich milk and cream mixture, with other ingredients to increase the viscosity, is recommended. Of the ingredients added for this purpose milk solids are perhaps the most satisfactory. In ice cream made in the home, an increase in milk solids may be obtained by the use of evaporated milk or dry milk solids. The quality of ingredients used in the mixture affects the finished product greatly and determines the flavor. All ingredients should be of high quality. Milk that is sour, nuts that are rancid, or cream that is stale affects the flavor adversely.

Mixtures that are high in sugar have a low freezing point. If too much sugar is added, freezing may be prevented entirely. Substances that are in suspension, such as fat, do not lower the freezing point.

The temperature at which freezing occurs and the rate of freezing also affect the character of the product. The desirable rate depends upon the method of freezing. As a rule desserts which are stirred while freezing are superior if frozen rather slowly. This permits a separation of the crystals as they form. On the other hand, mixtures which are not stirred while freezing are better if frozen rapidly. The method most frequently used is to freeze the mixture rather slowly and depend upon agitation by beating to increase the number of crystals formed. This causes many crystals to be formed rather than one immense ice crystal, just as a body of water when churned by a raging wind freezes into many smaller crystals rather than a solid cake of ice. Beating also incorporates air, which aids in keeping the crystals small. However, the beating is of little value until the mixture has become viscous by thorough chilling so that the air introduced is retained. Then it increases the volume and makes a more velvety texture. Whipping the cream before it is added is of value for this reason.

Characteristics

The color of any frozen dessert should be delicate and in harmony with the flavor. Often artificial coloring is added for this purpose. The flavor

of the dessert is the most important consideration. It should be definite yet delicate. The texture of the dessert varies with the type. Frappés and granites are rough and icy, ices and sherbets are less grainy, and ice cream and mousses are quite smooth. Ice cream should be neither a jelly nor a foam. Since it contains milk solids and often eggs and other solids, it should melt slowly, and should melt to the consistency of medium thin cream. Mousses and similar products are quite rich, but they should not be so rich that they leave the mouth coated with fat.

The freezing process

Mixtures that are to be stirred during freezing should not fill the container more than two thirds full. This allows for the expansion of overrun produced by the beating in of air. Although in commercial ice cream an overrun of 45 or 50 per cent is common, in home freezing the overrun seldom exceeds 35 per cent. If the container is too full, the expansion cannot take place and the mixture will be coarse.

Such mixtures may be frozen in a freezer equipped with a dasher and crank for turning or in a vacuum freezer, which requires only occasional stirring. The former freezes in less time and gives a smoother product. Before use, the freezer and any parts which come in contact with the cream should be scalded and then cooled.

Although ice cream will freeze when only a small proportion of salt to ice is used, one part of salt to eight parts of ice is generally recommended. This allows for freezing at a moderate rate so that rather large amounts of air may be incorporated and a smooth velvety texture secured. With these proportions, waste of ice and salt due to too rapid melting does not occur. When mixtures are not stirred it takes much longer for them to freeze throughout; so a lower temperature is desirable. Therefore when mousses and other desserts which are not stirred are frozen, a higher proportion of salt is used. One part of salt to either two or three parts of ice produces good results. Granular products, such as frappés and granites, require more rapid freezing than ice cream; hence a higher proportion of salt to ice is generally used in their preparation.

Salt and ice may be mixed before being packed around the mixture. Another method is to fill the container about one half full of ice first, then add a layer of salt, then a layer of ice, and repeat until the ice and salt mixture extends a little higher than the material to be frozen. While freezing, the water should not be drained from the ice unless there is danger of its seeping into the frozen mixture. The water increases the speed of the melting of the ice and causes the mixture to freeze more rapidly.

Mixtures that are stirred are ready to be packed when firmly frozen. The dasher, if used, is removed, and the cream is packed in solidly. The container is covered tightly and is repacked with ice and salt. One part of salt to four of ice is recommended. It is not necessary to draw off all of the water on the ice, but the ice should be packed down firmly and any extra water should be drained off. In order to ripen, ice cream should stand for an hour or two before serving. During ripening there seems to be a blending of flavors, and the ice cream hardens and apparently becomes smoother. Part of the change in flavor may be due to hardening of the fat and part to a slight increase in acidity.

The increased use of mechanical refrigerators has resulted in the making of many frozen desserts in their freezing compartments without continuous stirring. Since the crystals are not separated by mechanical means as they form, other methods must be used. Any condition which causes the ice crystals to form quickly and which aids in distributing the water is of value in producing unstirred ice cream of good quality. A low sugar concentration and a low freezing temperature cause the mixture to freeze quickly. The use of a large proportion of solids or stabilizers and the incorporation of air in beaten egg whites, whipped evaporated milk, or whipped cream, or both, aid in forming small crystals. The addition of cream is the most satisfactory method of reducing the size of crystals in unstirred frozen mixtures. However, there are several objections to the use of rich cream. It greatly increases the cost of the dessert, it results in a dessert high in calories, and it may be somewhat unpalatable if the percentage of fat becomes excessive. This is especially noticeable if there has been clumping of the fat due to too much beating. Twenty per cent cream may be quite successfully whipped if properly aged and icy cold. The addition of two teaspoons of lemon juice to one pint of 20 per cent cream has been found to be of value. Stiffly beaten egg whites to which part of the sugar has been added are helpful in obtaining products of fine texture. The egg whites may be folded in when the mixture is frozen to a mushy consistency. Marshmallows, partly melted, may be added at this point or earlier. The stabilizers listed as being of value in the making of stirred ice cream are also used in the unstirred mixtures. The value of rennin, dried milk, corn syrup, egg yolk, India gum, agar, pectin, and cornstarch in unagitated ice cream has been studied, and it was found that rennin and India gum were not satisfactory stabilizers. Agar in sufficient amounts to be of any value produced a jelly, but, when added with dried milk, it was beneficial in smaller amounts. Pectin was of some value but not as desirable as agar, and gelatin was less desirable than

either pectin or agar. Egg yolks alone were not especially good but, when used with either starch or dried milk, improved the texture; the flavor, however, was less acceptable.

Although there is still much work to be done before perfecting a method for the making of unstirred frozen desserts, that which has been done indicates that there is little likelihood of obtaining a dessert frozen without continued stirring which meets the standards for ice cream stirred while freezing. However, an acceptable product may be obtained, and this type of dessert will no doubt continue to be extensively used.

ACTIVITIES

1. Prepare frozen desserts, stirred while freezing, selecting from among the following:
   - American ice cream
   - Apricot ice cream
   - Apricot sherbet
   - Burnt almond ice cream
   - Caramel custard ice cream
   - Chocolate ice cream
   - Cider frappé
   - Coffee frappé
   - Cranberry frappé
   - French ice cream
   - Grape ice
   - Lemon ice
   - Lemon milk sherbet
   - Nut ice cream
   - Orange cream sherbet
   - Orange sherbet
   - Peppermint ice cream
   - Philadelphia ice cream
   - Rhubarb granite
   - Strawberry ice cream
2. Prepare frozen desserts not stirred while freezing, selecting from among the following:
   - Chocolate mousse
   - Coffee parfait
   - Frozen fruit
   - Grape mousse
   - Maple parfait
   - Nesselrode pudding
   - Orange sherbet

Raspberry mousse
Vanilla ice cream
Velvafruit

Refer to *Practical Cookery*, "Desserts," pp. 172–182; Heseltine and Dow, *The Basic Cook Book*, "Frozen Desserts," pp. 546–559.

Recipes for products selected not found in these references are to be supplied by the instructor.

Fats and Oils

Cream, butter, and fat meats have comprised part of man's diet during most of his recorded history. The separation of lard and tallow from the meats of which they were a part, and their use in other foods, probably soon followed. In general, fats were a coveted food regarded as important in a satisfactory meal. Such phrases as "living on the fat of the land" indicate the high regard in which they were held.

Olive oil, the first vegetable fat to be widely used, has been used for centuries by the people along the Mediterranean Sea and in the adjacent area. Only near the end of the nineteenth century did other oils become of commercial importance.

Today soybeans and cottonseed are the two important sources of vegetable oils in this country, although olive oil and corn oil remain favorite salad oils for many people. Peanut oil too is available and is usually well liked. The estimated per capita consumption of fats and oils in 1953 was 44 pounds, almost equal to the 1935–39 average. However, a comparison of the individual fats shows that whereas the per capita consumption of butter and margarine was placed at 16.8 pounds and 2.8 pounds respectively for the 1935–39 period, it was placed at 8.6 pounds and 7.9 pounds respectively for 1953. There was an increase in consumption of "other edible fats and oils" from 6.4 pounds in 1935–39 to 9.4.[1] This latter group includes largely the oils used in mayonnaise, salad dressings, and salad and cooking oils. The consumption of lard and shortening was not greatly different for the two periods. As reported by the Bureau of Agricultural Economics, lard probably refers to the fat rendered from the pork carcass, whereas shortening includes fats which from time to time

[1] *National Food Situation*, NFS-71, United States Department of Agriculture, February, 1955.

have been referred to as lard substitutes, lard compounds, cooking fats, vegetable oil-lard compounds, hydrogenated shortening and perhaps other terms.

After 1909 the shortening industry gradually shifted from lard compounds to vegetable shortenings. This was made possible by the use of the hydrogenation process which enabled the industry to produce a fat of the desired degree of hardness. Cottonseed oil was used largely in the early production of hydrogenated fats although probably some corn and possibly other oils were used in small quantities. In the early 1930's soybean oil began to be used and by 1943 approximately equal quantities of cottonseed and soybean oils were used in the manufacturing of shortening. However, by 1952, 849 million pounds of soybean oil was used as compared to 385 million pounds of cottonseed oil. During this same period the use of lard in shortening increased from 36 million pounds to 235 million pounds.[1] It was estimated that in early 1954 at least 50 per cent of the federally inspected lard produced in this country was stabilized by one of the approved antioxidants.[2] This has improved the keeping quality of lard and is no doubt largely responsible for its increased use.

Oil from various other sources including the cocoa bean, kernel of the palm nut, palm, rapeseed, sesame seed, poppy seed, mustard seed, and sunflower seed may be important in other countries but are consumed in relatively small amounts in the United States. Solid natural fats are largely of animal origin, pork being the chief source.

Fats and oils differ physically in that fats are solid at room temperature (18° to 25° C. or 65° to 77° F.) and oils are liquids. Chemically they are alike in being compounds of glycerol, which is a triatomic alcohol, and of fatty acids. They differ in the type of fatty acids that they contain. Vegetable oils are extracted or expressed from the fruit or seed by means of pressure. The olive is of such a nature as to permit a partial expression of the oil without the application of heat. The product thus obtained is known as virgin oil, is of high quality, and does not require purification or clarification. The rest of the oil from the olive, and most other oils, are extracted after the fruit or seed has been heated. This removes part of the coloring and flavoring matter from the plant tissues, so decolorization, deodorization, and frequently clarification are essential. Lard and tallow are separated from the animal tissue by the application of heat. Three types of lard are manufactured commercially, the prime-steam, neutral,

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

[2] H. R. Kraybill, and L. R. Dugan, Jr., "Antioxidants New Developments for Food Use," *Journal of Agricultural and Food Chemistry* 2:81–84. 1954.

and kettle-rendered. Prime-steam lard is rendered in an enclosed kettle into which steam under pressure is forced. It may be either smooth or grainy, depending upon the rate of cooling. Neutral lard is obtained by slowly heating back fat and leaf fat. It is white in color and lacking in definite flavor. Kettle-rendered lard is obtained by heating the fat in steam jacketed kettles. Lard thus prepared has the best flavor but is dark in color, and this method results in smaller yields than does the steam treatment.

In addition to the fats from one source, such as animal fat or vegetable fat, there are fats combined from various sources. Some of these, known as compounds, may be combinations of fats from both animal and vegetable sources or from one or the other. Among the combination fats are the margarines, sometimes classed as butter substitutes. "Oleomargarines" may be made up largely of "oleo oil," which is a soft beef fat, and "neutral lard." Vegetable margarines, as the name implies, contain no animal fats. It was estimated that in 1952 only 11 million pounds of animal fats were used in the manufacture of margarine whereas 1035 million pounds of vegetable oils were used. Of these, 353 million pounds were cottonseed oil, 651 million pounds soybean oil, and 31 million pounds "other," [1] including corn and peanut oils. Margarines made by different companies have different formulas, but the general procedure followed is the same. The fat mixture is churned with whole milk, skim milk, a mixture of milk and butter, or with cream, depending largely on the grade of product desired. It is then cooled, washed, salted, and worked just as is butter.

As previously stated, oils and fats differ chemically in the fatty acids they contain. The acids in oils are largely unsaturated; that is, they are capable of combining with more hydrogen if conditions are suitable. For many cookery purposes, either a fat or an oil can be used with equal satisfaction. However, there is still a general preference for a solid fat. As a result, a method has been developed whereby hydrogenation of fats can be done on a commercial scale to give, within limits, any degree of hardness desired. Hence there are on the market many hydrogenated fats sold under various trade names. Such treatment of fats is not limited to oils alone. Hydrogenated lard is also being prepared in an attempt to meet current demands more nearly. In addition to changing the consistency of the fat, hydrogenation changes the color and alters the flavor and odor. It also improves the keeping quality.

New methods of processing lard are now being used to produce a taste-

[1] *Agricultural Statistics 1953*, United States Department of Agriculture.

less, odorless, creamy shortening that will keep from one to one and a half years without becoming rancid. This is accomplished by hydrogenation, addition of antioxidants, deodorization, caustic refining, and plasticizing.[1]

Keeping quality

The spoilage of fats is due to oxidation, hydrolysis, and the absorption of odors. Oxidation occurs in the oils and unsaturated fats, producing an effect sometimes spoken of as "tallowiness." Oxidative rancidity is undoubtedly the most serious cause of deterioration of food fats and is encountered in cereal products, pork, and numerous other foods. The great losses of foods caused by rancidity have no doubt stimulated studies on the problem. Extensive research has been and continues to be carried out in an endeavor to find a more effective antioxidant. As a result there are a number of chemical compounds which have been shown to be effective in delaying the onset of rancidity and which are also harmless when added to foods. Spoilage by oxidation requires the presence of oxygen. It is accelerated by heat, light of certain wave lengths, moisture, traces of metals, such as copper, iron, and nickel, and by acids.

Hydrolysis is the changing of the fat to produce free glycerol and fatty acids. The free glycerol has little effect upon the palatability of the fat, but the free fatty acids affect it adversely. Those of low molecular weight, such as the ones in butter, are so distasteful that hydrolyzed fat containing a marked concentration of fatty acids may be inedible. Once rancidity due to hydrolysis has started, it progresses rather rapidly. Spoilage of fats by hydrolysis may be delayed by the exclusion of light, air and moisture and by storage in a cold place. Fat which is entirely free from particles of food or from traces of metals such as copper or nickel is less susceptible to spoilage than are fats containing foreign substances.

A third type of spoilage comes from the absorption by fat of flavors and odors. Any foreign odor, whether of flowers, fish, onions, or what not, is readily absorbed. Although this characteristic may be of great value in the manufacture of perfume, it is not always an asset in food preparation.

Nutritive value

Fats, being a highly concentrated form of food, are especially valuable in the high-calorie diet. They are important in the average diet because of their "staying qualities" or the slowness with which they are digested. Further, it is an accepted fact that certain fatty acids are essential in the normal diet. Some fats are valuable for the vitamins they supply.

[1] *Food Field Reporter*, June 23, 1947.

Vitamins A, D, and E are fat-soluble and are associated with certain of the food fats.

Cookery qualities and functions

Fat is used in food preparation as a frying medium, as a shortening agent for the flavor and change in texture that it gives to certain foods, and as a basis for certain salad dressings. Fat to be used as a frying medium should have no undesirable flavor. The decomposition point or smoking temperature should be high, and even at that point decomposition should proceed slowly. Such a fat makes possible the frying of foods at a high temperature without the disagreeable odor and flavor characteristic of decomposed fat. The decomposition point of a given fat is lowered if a greater surface is exposed. Hence the practice of using a deep kettle with a small surface for frying is a wise one. It has also been found that foreign particles such as crumbs, bits of food, and flour lower the smoking temperature. The necessity for straining fat after each use is thus explained. Hydrolysis, or the presence of free fatty acids, also hastens decomposition upon heating. Fat which has been heated for a period of time smokes more than it did at the beginning of the heating period, though the temperature to which it is raised remains the same. The temperature at which smoke from various fats became visible when heated under carefully controlled conditions is given in Table 43.

Even if fat with a high decomposition point is used in frying, it is important that the recommended temperature be maintained if a product of high quality is to be obtained. The only way to ascertain a temperature with accuracy is to use a thermometer. The range of temperatures for frying cooked foods such as croquettes, codfish balls, and potatoes, either French fried or souffléed, is between 196° and 202° C. (385° and 395° F.); that for doughnuts, crullers, croutons, and croustades is between 185° and 190° C. (365° and 375° F.). If the fat is too hot, the food becomes deep brown in color and hard on the surface but is not cooked in the center. If the fat is not hot enough, the food may be soggy, grease-soaked, and generally unattractive. Absorption of fat adds to the cost of fried food. The longer the period of cooking, the more fat is absorbed.

Temperature and time, however, are not the only factors affecting the absorption of fat. The composition of the food plays a part, as is shown in doughnuts. Those with an increased sugar, fat, or egg content absorb more fat if other ingredients remain the same. Also, a softer dough absorbs more than a stiffer one if other conditions are the same. The fat absorption tends to increase with increased surface area.

TABLE 43. THE SMOKE POINTS OF SOME EDIBLE FATS *[1]

Kind of Fat	Smoking Temperature (official A.O.C.S. method used) Degrees C.
Shortenings [2]	
Crisco	180
Dexo	183
Durkees	188
Fluffo	177
Jewel	231
Mrs. Tucker	184
Natco	180
Royal Satin	181
Snowdrift	180
Spry	180
Swiftn'ing	184
Oils	
Mazola	227
Peanut Oil	232
Lards [3]	
Armours Texturated	185
Black Hawk	191
Boone River	192
Hormel	184
Iowa State College (open kettle rendered at Animal Husbandry Department)	183
Silverleaf	188
White Clover	206

[1] Personal communication Belle Lowe. Published with permission of Belle Lowe and Procter and Gamble and Company. May, 1955.

[2] All shortenings except Jewel contained an emulsifier. The smoke point of Jewel is significantly higher than that of other shortenings indicating the effect of an emulsifier on the smoke point.

[3] All lards, except Boone River and Iowa State College, were from nationally known packers and contained antioxidants. Armour's texturated lard contained an emulsifier also.

As a shortening agent, fat has a wide use. A shortening agent is one that decreases the resistance of cooked flour mixtures to breaking or crushing. Most of the so called shortenings and some lards have emulsifiers added. These make it possible to distribute the fat more easily and probably aid in the formation of an emulsion when a rather high proportion of liquid is present as in a cake. The capacity of fat as a shortening agent is due, in part, to the fact that it is insoluble in the other ingredients and is thus able to effect a mechanical separation of the framework of the flour mixture.

It is dispersed by egg and absorbed by sugar and flour particles. Practically all other ingredients of a dough are solidified by cooking, but fat melts. Around the melted fat it is easier for the gas to expand, as can be noted in flaky pie crust. Thus, instead of a continuous framework, hard and unyielding, such as might be formed by the protein of the flour when baked, the use of fat tends to give a less resistant structure by separating the particles of flour. The product resulting from inclusion of fat in a dough is frequently spoken of as tender.

The effectiveness of fat as a shortening agent appears to be influenced by the plasticity of the fat and by the presence in it of unsaturated fatty acids. A plastic fat seems to resist being squeezed out of place more than a nonplastic fat, and so is more effective as a shortening agent. Lard, lard compounds, and many hydrogenated fats are quite plastic. Fats containing unsaturated fatty acids cover a larger surface area than do fats high in saturated fatty acids. This is believed to account for the greater shortening power of unsaturated fats as compared with saturated ones. Oils contain a larger proportion of unsaturated fatty acids than do lard and lard compounds. Butter is low in unsaturated fatty acids as compared with the above fats and low in plasticity, a characteristic considered desirable in shortening agents. In spite of this, some investigators rate butter fat rather high as a shortening agent. Lard, lard compounds, and cottonseed oil are ranked among the best. The effects of the method of mixing, of the temperature at which the ingredients are mixed, and of other ingredients are so great that for practical purposes allowance is seldom made for the difference in the shortening power of various fats. Fat is a better solvent than water for the organic substances which are important in the flavoring of baked products. For that reason fat often helps to blend the flavors in baked products.

Butter and olive oil are popular for flavoring, although bacon fat and drippings from other meats are used in some households. In many sauces, such as butterscotch and chocolate, butter both adds flavor and modifies the texture. Oil is an important part of mayonnaise and French dressings and is used in many other food preparations.

PROBLEM 14 *How shall fried foods be prepared?*

Frying is defined as "cooking in a pan with fat, over a fire." It has been the general practice in the past to designate only the cookery of foods in large amounts of fat or in deep fat as frying, using the term sautéing for cooking in smaller amounts of fat. The difference between the term as defined and its accepted implication led to much confusion in discussions of food preparation, particularly as pertained to meat. The sub-committee on cooking, of the Committee on the Factors that Influence the Quality and Palatability of Meat, of the National Cooperative Meat Investigations, recommended that the term frying be used to refer to the cooking of food in fat: that it be "applied especially (1) to cooking in a small amount of fat — called also sauté; (2) to cooking in a deep layer of fat — called also deep-fat frying." The amount of fat used is sometimes shown by the terms pan frying, and deep fat frying to designate cooking in small and larger quantities respectively.

Foods cooked in a large amount of fat often absorb less fat than those cooked in a small amount. Further, the greater ease in measuring and controlling the cooking temperature in deep fat frying facilitates the production of a standard product. For these reasons, deep fat frying is favored, and more attention is being given to it than formerly.

Effects of frying

A crisp brown crust is formed on most foods during frying. In the case of potato chips the entire product becomes crisp. The process may entirely change the appearance of the product and may also change the texture to a certain extent. A characteristic flavor and odor commonly regarded as pleasing are also developed. Accompanying these changes in appearance, texture, flavor, and odor is an absorption of fat.

Absorption of fat

It is desirable to keep the absorption of fat at the minimum. Hence, the factors affecting absorption during cookery are of prime importance. These are the temperature of the fat, the time of cooking, and the surface area of the product. As a rule, the higher the temperature of the fat dur-

ing the cooking process, the less fat will be absorbed. However, extremely high frying temperatures are undesirable. A difference of ten or twenty degrees in the initial temperature may not greatly affect the absorption of fat by the fried product. It may, however, affect the color, texture, and volume of certain products. The marked effect of the addition of cold food to the hot fat is not always recognized. It has been found that the addition of about two ounces of sliced potatoes may lower the temperature of four pounds of fat as much as nine degrees C. (sixteen degrees F.). Food may be added in such large amounts as to cool the fat greatly, necessitating a longer cooking period, and thus increasing the fat absorption of the product.

In general, the longer the cooking period and the greater the surface area, the greater the amount of fat absorbed, if other factors remain the same. The composition and nature of the foods are also important factors. Their influence has been extensively studied on food comprised of several ingredients, such as doughnuts. In these investigations it has been found that varying the ingredients has a definite effect on fat absorption. The studies on doughnuts show that increasing the fat, increasing the sugar, or decreasing the flour in the product tends to increase the fat absorption if the other proportions are unchanged. The amount of mixing is also a factor. Increasing the number of strokes in mixing tends to decrease fat absorption, although some exceptions have been noted. The kind of flour used affects absorption, for it has been found that substituting pastry flour for bread flour or milk for water tends to increase fat absorption. Allowing the dough to "ripen" or stand for an hour or longer before frying tends to decrease fat absorption.

The selection of the fat is important regardless of the product to be fried. A desirable fat for frying, as a rule, is odorless, tasteless, either almost or entirely colorless, and has a high decomposition point. Fats especially suited for frying purposes are corn and cottonseed oil, lard of high quality, and many hydrogenated fats. These not only have high decomposition points, but once decomposition has started, it progresses rather slowly. Electric deep fat friers or cookers which can be used for deep fat frying are convenient and are quite widely used. They make it relatively simple to maintain the temperature of the fat near that recommended for the product being fried. Utensils to be used on a range should, as a rule, be made of rather heavy material so that the temperature will not fluctuate markedly. Heavy iron or aluminum is satisfactory. A deep kettle with a small surface area is preferred, as the minimum decomposition of the heated fat then results.

Frying temperatures

The temperature of fats for frying is best determined by means of the thermometer. If no thermometer is available, cubes of stale bread may be used as indicators. The time required to brown a cube of bread, although not exact, serves as a measure of temperature. In fat from 182° to 193° C. (360° to 380° F.), the temperature used for most uncooked foods, a cube of bread browns in 60 seconds; in fat from 193° to 204° C. (380° to 400° F.), the temperature used for most cooked foods, a cube of bread browns in 40 seconds. There are, however, exceptions to both the above recommended temperatures. Potato chips are quite satisfactory when cooked at a lower temperature: 177° C. (350° F.) gives good results.

Using a temperature above that recommended may not only cause excessive decomposition of the fat, but has various other effects upon the product. Potato chips may become too brown and may develop a strong flavor without becoming crisp; doughnuts may brown without being thoroughly cooked; croquettes may brown and the crust become crisp without the product being heated to the center; and meats may brown without being cooked sufficiently.

Potato chips

In making potato chips, the quality of the product is affected by the kind and treatment of the potato as well as by the method of frying. Certain potatoes are especially suited for the purpose and others are not. Generally the mature potato, relatively high in starch, is preferred to the new, immature potato. Potatoes which have been stored at a temperature only a few degrees above the freezing point tend to be high in sugar. Such potatoes, if used for frying, should be held at room temperature for a few days before using. Soaking the sliced potatoes in cold water for an hour or longer before frying removes part of the starch, and the potatoes brown more uniformly. If, after soaking, the potatoes are thoroughly dried before being added to the fat, they do not cool the fat so much, and cooking proceeds more rapidly. Potatoes especially, but other foods, too, should not be added to the fat in too great quantities, as this also may cool the fat greatly.

ACTIVITIES

Prepare the following fried foods:

- Croquettes
- Doughnuts
- French-fried potatoes
- Potato chips
- Shrimp
- Vegetables such as
  - cauliflower
  - onions

Refer to *Practical Cookery*, "Deep Fat Frying," pp. 146–147; Heseltine and Dow, *The Basic Cook Book*, "Frying," pp. 38–39, and individual recipes for croquettes, doughnuts, etc.

Food Adjuncts

Condiments and other food adjuncts are sometimes referred to as "food accessories," inasmuch as in general they are used primarily to add flavoring or seasoning. These include salt, vinegar, spices and herbs, flavoring extracts, and coloring matters.

Salt

Salt may be regarded as indispensable. Wild animals frequently travel miles to a "salt lick" to satisfy their craving for it. Man's insistent desire for the savor of salt has led governments to establish monopolies on its sale as a means of obtaining a constant and sizable income. Although the evaporation of brines, mainly ocean water, by the sun is not a major method of obtaining salt, thousands of tons of solar salt are obtained each year along the coasts of France, Portugal, Turkey, Russia, India, China, the tropical islands, and the United States. Salt deposits found in inland areas may be mined, but frequently water is pumped to the underground deposits, where it dissolves the salt. The brine formed is then brought to the surface where it is evaporated, and the salt is refined and prepared for the market. Much of the salt bought in cardboard containers for table use is fine-grained, and has a harmless chemical added to prevent caking as a result of the absorption of moisture from the air. In large areas of the United States where iodine is deficient, salt which contains 1 per cent of potassium iodide is extensively used. Salt is said to have over 1500 uses, one of which is to increase the palatability of food. It is also used in the curing of meats and fish and in the making of pickles, butter, and cheese. Rather than adding a distinctly new flavor, it brings out the flavor of foods. Even the flavor of sweet foods is improved by the addition of a few grains of salt.

Vinegar

Vinegar, too, is a widely used condiment. When unqualified, the term means cider vinegar, although a great many different fruit juices may be

used in making vinegar. Of these probably grape juice ranks next to cider in quantity. Vinegar has long been used in food preparation. Its antiquity probably equals that of wine, since sour wine and vinegar are very similar. Indeed, the word "vinegar" comes from two French words, *vin* and *aigre*, meaning "sour wine." Vinegar is a dilute acetic acid solution, 4 per cent being the minimum amount allowed by government standards. The acid is produced by the action of certain bacteria, the most useful of which is *acetobacter aceti*, which oxidize alcohol to acetic acid. The flavor and odor of the final product are largely dependent upon the material used as a source of the alcohol. Such fermentable mixtures as barley malt, hydrolyzed cereals, and starches or other carbohydrates are used either in combination with fruit juices or as separate sources. The action of yeast during fermentation may result in by-products which also affect the flavor, sometimes adversely.

In certain parts of the world, especially in Europe, grape vinegar is much in demand, though in the United States as a whole there seems to be a decided preference for cider vinegar. Grain or spirit vinegar, distilled vinegar, or white vinegar made from sugar, syrup, or molasses is frequently found to have a harsh flavor. The latter, as well as malt vinegar made from barley malt and other cereals, has the advantage of being colorless.

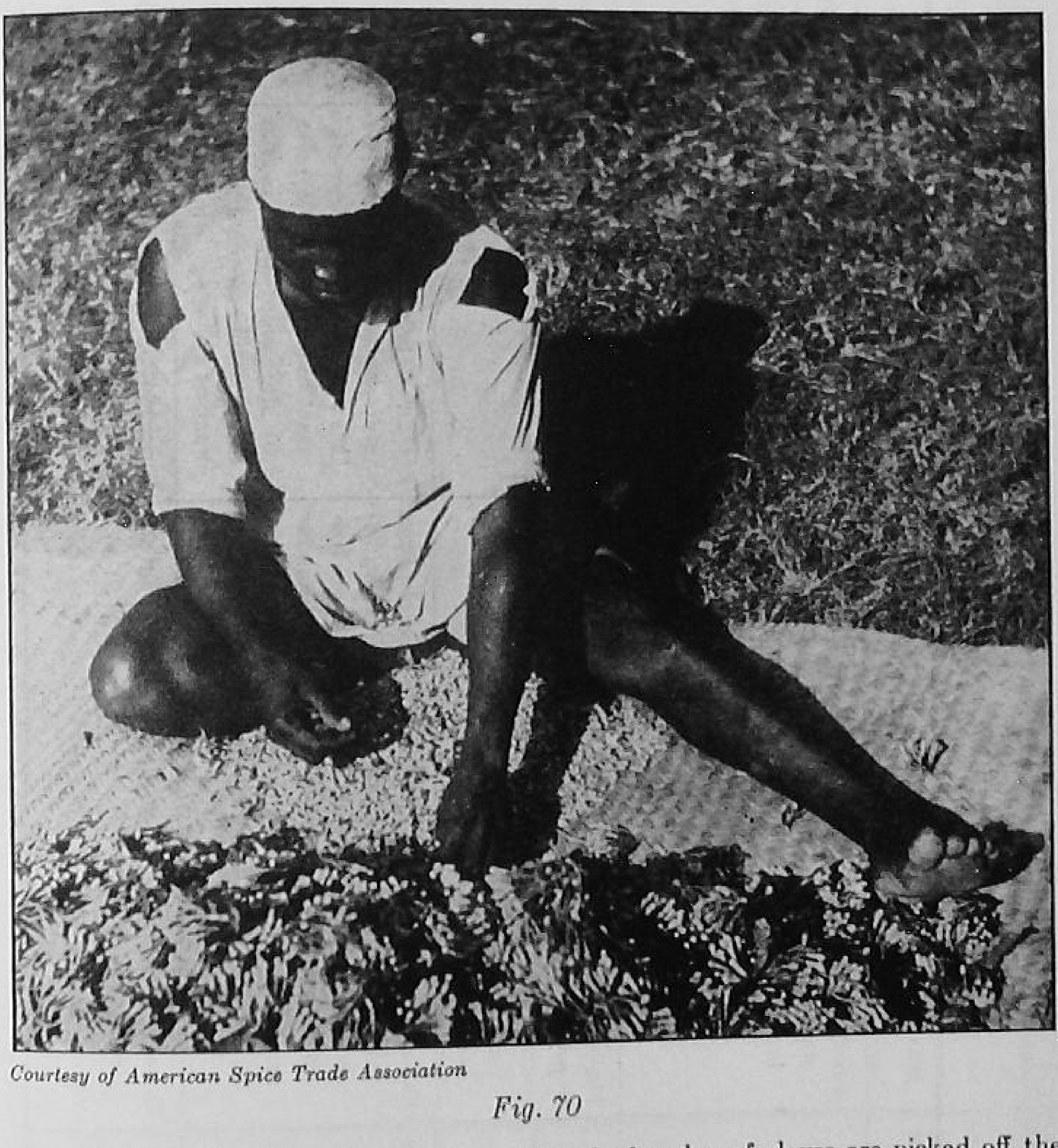
Tarragon vinegar, vinegar to which tarragon leaves are added for flavor, is popular for use in sauces for meats (especially fish), in salad dressings, and in other products. Chili vinegar, shallot vinegar, and garlic vinegar are also available. In each case the name suggests the product added to provide flavor.

Spices and herbs

Countries have been discovered and wars fought in the search for spices. Although these have little or no food value, they add interest to a meal and often the difference between an ordinary dish and a famous dish of distinctive flavor is the dash of seasoning used.

Except for mustard seed the products classed as spices are imported almost entirely by the United States. It is estimated that 135,286,000 pounds of spices were used in 1952, and of that amount 19,211,000 pounds of mustard seed were produced in the United States for consumption. This gives a per capita consumption of spices of 0.8 pound for 1952, an amount close to the average apparent annual per capita consumption since 1918. In terms of quantity imported mustard headed the list with over 31 million pounds, black and white pepper were the second with just

over 28 million pounds, then paprika with almost 9 million pounds. Other spices imported in excess of 5 million pounds in 1952 were poppy seed, caraway seed, capsicum and nutmeg.[1] Many of the spices may be obtained either whole or ground. In any event it is wise to purchase them by weight and, if they are ground, in a sealed container.



Courtesy of American Spice Trade Association

Fig. 70

De-stemming cloves in Zanzibar. After the bunches of cloves are picked off the tree, the buds are separated from the little stems which hold them in a cluster. This is accomplished by holding the bunch in one hand and brushing off the buds against the palm of the other.

[1] *Consumption of Food in the United States 1909–52*, Agricultural Handbook No. 62, Bureau of Agricultural Economics, United States Department of Agriculture, 1953.

Table **44.** SPICES AND OTHER FOOD ADJUNCTS AND THEIR USE

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Allspice (pimento)	Jamaica, Central America, and India.	Nearly ripe berries of pimento trees. May be obtained either whole or ground. Flavor considered to resemble mixture of spices, especially cinnamon, nutmeg, cloves.	Discovered by Columbus. Used in West India cordial, pimento dram.	Seasoning meats, soups, cakes, cookies, puddings, pickles, preserves, spiced jellies, and sweet sauces.
Angelica	Native to Alps; grows as far north as Iceland and Lapland.	Young tender leaf-stalks and midribs used.	Natives of Lapland use fleshy roots as food and stalks as medicine.	Candied and used as garnishes and as confections.
Anise (also aniseed)	Russia, Spain, India, Egypt, Syria, and other Mediterranean countries.	Small fruit of an annual plant. Is much used in flavoring licorice. Star anise is frequently one inch in diameter but resembles common anise in flavor.	Romans believed a sprig hung near beds would ward off bad dreams. Another ancient belief was that a sprig of the plant held in the hand would prevent an attack of epilepsy.	Sprinkled on coffee cakes and sweet rolls. Used in cookies, candies, and sweet pickles, and in making the cordial anisette.
Bay leaves	Greece, Italy, California.	Foliage of laurel tree. Dried.	Important in Greek and Roman mythology. Leaves of the sweet laurel were gathered for wreaths of victory.	Seasoning for meats, soups, stews, croquettes, and pickles.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Capers	Islands of the Mediterranean sea.	Unopened flower buds of a shrub, the caperbush. They are carefully dried after picking, then stored in barrels of brine or vinegar.	Introduced into Great Britain as early as 1596. Cultivated long before that on a large scale in France and Italy. References to it are found in Latin poems.	Used in sauces, pickles, and meats.
Capsicums	Cultivated in nearly every part of the world.	Includes chili, paprika, cayenne, peppers as a vegetable, and tabasco.	Native to tropical America.	(See specific products listed.)
Caraway seed	Holland and Denmark.	Fruit-like seeds of the caraway plant, which has delicate white flowers.	Dates to ninth century. Earlier its essential oil was used in perfume.	Seasoning bread and cakes. Making kümmel cordial. Added to boiled cabbage and sauerkraut, beef stock, and soft cheeses. Sprinkled over meats as pork, liver, and kidneys before cooking.
Cardamon or cardamom	Ceylon, India, Jamaica.	Yellowish pods filled with tiny black aromatic seeds. Fruit of a small tree or reedlike plant. Seeds possess an aromatic and agreeably pungent flavor.	Dates to first century.	Flavoring for sausages, Danish pastry, buns, rolls, cakes, sauces, curries, and soups. Whole pod used in pickles; ground cardamon in other cookery.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Cayenne	Best said to come from coast of Africa.	Ninety varieties with many different types of pods known. In general pods are small, conical-pointed, less than an inch in length, and a light brownish-yellow when ripe. They impart a fiery sensation that lasts. However, according to the U.S. standards, cayenne must be made from the berries of capsicum frutescens.	Portuguese are said to have brought it to America.	Used in meats, salads, sauces, pickles, and cheese dishes. A powerful stimulant. In small amounts, said to aid digestion.
Celery seed	France, India, and United States.	The seed of the familiar celery plant.	Marco Polo believed to have brought it from India.	Used in pickles, celery salt, soups, sauces, and tomato juice cocktails.
Chervil	All temperate climates.	Young leaves resemble parsley, the curled being even more attractive.	A high favorite in France.	Used in soups, stews, meat gravies, salads, shrimp, and other fish cookery.
Chili Pepper	California.	Fruit pod of the Mexican capsicum plant. May be obtained either whole or ground.	The Aztecs developed these before Montezuma ascended throne.	Seasoning for soups, stews, and pickles. As the dominant flavor of chili con carne.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Chives	Europe and to some extent in United States.	Allied to onion and leek. Grown for their leaves, which grow in thick tufts like grass but are hollow like onion leaves. Used fresh.	Native to Europe, Asia, and northern parts of North America.	Used in soups, sauces, salads, omelets, eggs, Maryland fried chicken, and deviled crab. Not a substitute for onion but often used with it.
Cinnamon and cassia	Dutch East Indies, China, Sumatra.	Two spices of about the same flavor used interchangeably but coming from different species of tree. Bark of cinnamon or cassia tree which has been scraped and dried into quill-like rolls. May be obtained as stick or may be ground.	Probably known to earliest man. In earlier days a commodity of great value. Said to have been the cause of much human bloodshed.	Seasoning pickles, preserves, mincemeat, pies, cookies, buns, and puddings. Making cinnamon toast. Used in so many holiday dishes it is often called the "joy spice."
Cloves	Zanzibar (Dutch East Indies), Madagascar.	Dried flower buds of the clove tree, a handsome evergreen. May be obtained either whole or ground.	Known to early Egyptians. Centuries ago cloves were an important ingredient in love potions in Persia. A favorite scent in oriental perfumes.	Seasoning roast hams, mincemeat, preserves, pickles, candy, cake, puddings, soused herring, spiced fruits, and jellies.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Coriander	India and Morocco.	Dried fruit of a small plant. Resembles a peppercorn. Flavor said to resemble a combination of lemon and sage.	Common product of Biblical times. Referred to in the Old Testament.	Used whole in pickles; ground in sausages, curries, sometimes in buns and by the Mexicans in soup. Sugar-coated seed a popular Scotch candy.
Coumarin See Tonka bean.				
Cumin (also cummin and cumino)	Mediterranean Islands and Morocco.	Small dried fruit resembling caraway seed in shape.	One of oldest spices known. Many references to it in the Bible.	Large usage in making of chili powder for Mexican type of cookery. Also used to season sausages and in curries.
Curry powder	Widely used in India.	A condiment originally so highly seasoned as to be little used in temperate climates. A blend of many spices usually containing turmeric, which adds the characteristic color.	Originally a prescription to cure stomach troubles. Over 4000 years old. The "finishing" or seasoning with curry was at one time considered an epicurean rite of English army circles in India, many officers priding themselves on the special combination of spices used.	For seasoning meats, poultry, fish, eggs, and vegetables, especially when combined with rice.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Dill	Spain, Portugal, and France. Now widely grown in Europe and America.	A hardy, easily grown shrub. The seeds are chiefly used, although sometimes the leaves and stems are included. The essential oil has largely replaced the whole herb spice.	A native of Spain. A favorite of the German people, who have created dill pickles.	Used as flavoring, especially for pickles, sauces, soups, and fish.
Fennel	Native to Europe but common in all temperate climates.	Seeds of common garden or sweet fennel and of common or bitter fennel.	One of ancient spices flourishing in India. Once believed to be a good fly-chaser. The wise men believed in fennel as one of the nine sacred herbs which could counteract the nine causes of disease.	Used for seasoning, especially valued in sauce for baking mackerel. Sweet fennel and florence fennel used as a vegetable; added to salads, soups, and stews.
Filé		Dried, powdered, tender sassafras leaves and leaf buds.	Popular in Creole cookery in the South.	Used to thicken gumbo, and in stews, tomato gravy, and vegetable casserole cookery.
Garlic	United States, South European countries.	Bulb of small vegetable similar to the onion but with bulb divided into 10 or 12 sections known as "cloves."	Famous in history. Popular in various parts of the world from earliest recorded days. Consumed by laborers who built Pyramids and by the legions of Ancient Rome.	Seasoning soups, sauces, salads, vegetables, meats, poultry, fish, pickles, breads, and numerous other foods.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Ginger	Africa, India, Jamaica, China, Japan.	Rhizome or root stock of perennial reedlike plant. May be obtained as powder or as root fresh, dried, candied, or preserved.	From India to Jamaica, sixteenth century. From India to Africa, eighteenth century.	Seasoning cakes, cookies, mincemeat, tea, pickles, preserves, pot roast, baked fruits, breads, pork chops, and chutneys.
Horse-radish	Grown in all temperate countries.	Pungent fleshy root. May be obtained fresh, ground and dried, or pickled. Best when fresh as it rapidly loses its pungency when exposed to air.	In eastern Europe for over a thousand years.	Condiment for meats, fish, and oysters. Seasoning for sauces.
Juniper	Widely distributed in northern hemisphere.	Dark blue berry, the fruit of an evergreen tree. Highly aromatic but too pungent to be eaten raw.	The juniper tree is mentioned in the Bible.	Used in brine for corned beef. In Europe largely employed to flavor gin; in Germany the wood of the shrub is used for smoking hams.
Mace	Dutch East Indies, West Indies.	Crimson net-like arillus or covering of the nutmeg kernel. Flavor similar to nutmeg but considered by many to be more delicate. May be obtained whole or ground.	Came to Europe when the Venetian Republic flourished (c. 1200).	Seasoning pound cakes, mincemeat, sausage, candy, pickles, preserves, and bouillon.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Marigold	All temperate climates.	Flowers of the calendula and the green part of the sweet-cented marigold used in food preparation.	Calendula was the "winking Mary-bud" of Shakespeare.	Calendula flower heads used for flavoring soups and stews, and buds used as substitute for capers. Sweet-scented marigold resembles tarragon and is used in same ways.
Marjoram	French Tunis, Germany.	Tiny leaves of a sweet aromatic herb. Used fresh or dried.	Of great antiquity. Early races used it for flavoring.	Seasoning for stews, soups, sausage, poultry, lamb, steaks, and chops.
Mustard	United States, England, Holland, Germany, Italy, India.	The ground seeds of the mustard plant. Mustard flour usually has from 15 to 25 per cent of the oil of the seed removed and the hulls are largely removed.	Originated in India before history began. Perfected in England. Known favorably to Hippocrates.	Seasoning for meats, mayonnaise, and pickles. Used in making gefüllte fish.
Nutmeg	East Indies, West Indies.	Kernel of the fruit of the nutmeg tree..	Came to us through ancient Egypt. The United States is the greatest nutmeg consumer.	Seasoning for sausages, cakes, puddings, mincemeat, eggnog, custards, soups, and cream sauces for vegetables.

Table **44.** (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Paprika, also known as sweet cayenne pepper, Hungarian pepper, pimienta, pimiento.	Spain, Hungary.	Fruit pods of large, sweet, aromatic capsicums. Varies in color from dark to bright red. Rather mild in flavor but agreeably aromatic. An excellent source of vitamin C. May be obtained whole or ground.	A modification of capsicums originally brought from India.	Garnishing, seasoning, and coloring of salads, mayonnaise, catsup, chili sauce, French dressing, and baked potatoes.
Parsley	Readily grown in widespread regions.	Leaves of plant native of Sardinia and parts of Southern Europe. Used fresh.	Parsley wreaths were twined about the victors of the Nemean games. Seeds were formerly mixed in cheese curds with other fragrant herbs.	Used for garnishing. Should have wider use as a delicate seasoning for soups, stews, sauces, poultry, fish, vegetables, cheese, salads and other foods.
Pepper	India, Sumatra, Singapore, French Indo-China, Borneo, Bangka, Siam.	Berries (peppercorns) of pepper vine. Black and white pepper come from same vine. White pepper obtained by allowing the peppercorns to mature and removing black outer skin of dried fruit. Black pepper is much stronger. Used whole or ground.	Early historians mention pepper as known to the race. Apparently one of first spices to be trafficked in by mankind. Pepper was part of the ransom demanded of Rome in the first decade of the fifth century.	Whole: seasoning meats, fish, corned beef, and pickles. Ground: the "always used" spice.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Poppy seed	Holland and Turkey.	Blue seed of the poppy plant, which produces brilliant flowers. About 900,000 slate-colored seeds to a pound.	Greeks and Romans used a mixture of honey, poppy seeds, and a pastry dough as a confection of great delicacy.	Topping for breads, rolls, and cookies. Oil used for margarine and salads.
Red pepper	United States, Italy, Africa, Japan, Mexico.	Ripe pods of edible fresh peppers or the red dried, ripe fruit of any species of capsicum.	Apparently has always flourished where man has made his home.	General seasoning, principally meats, fish, salads, and sausages.
Rosemary	Austria.	Leaf of a hardy evergreen shrub. Used fresh or dried.	One of the very earliest vegetable flavorings.	Seasoning meats and poultry.
Saffron	Spain.	Stigma of the saffron flower. About 3 to each flower and 225,000 stigmas to the pound.	Cleopatra liked it, and no doubt many queens before her. The most expensive spice.	Seasoning rice and meats. Flavoring and coloring for bread and rolls.
Sage	Dalmatia, but can be grown in all temperate climates.	Leaf of a shrubby plant. Used fresh or dried.	Said to be as old as the Dinaric Alps in Jugoslavia, between Croatia and Dalmatia on the west and Bosnia and Herzegovina on the east.	Flavoring for pork and sausage. Ingredient of poultry seasoning.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Sassafras	Grown along Atlantic Coast and to interior of United States.	Bark root of a large, ornamental tree of laurel family.	At several periods in American history has been used as a substitute for tea.	Employed medicinally as "sassafras tea." Used in flavoring confectionery and beverages.
Sesame seed	Turkey and the Orient. Mostly used at point of production. A luxury in America.	Small honey-colored seed resembling the tomato seed in shape.	Long known and appreciated by Oriental peoples.	In Germany used to flavor bread and cake and in Holland, in cheese. Used in cookies, rolls, and breads, to which it imparts a delicious nut-like flavor. Used in halvah, a Jewish candy. Also in making sesame seed oil.
Sweet basil	India and Persia.	Leaves of an aromatic plant. Flavor somewhat resembles that of cloves.	Originally a native of India. The plant is treated with veneration, grown around Hindu temples, etc. The Greeks liked it so well they christened it Basil, meaning King.	Used for seasoning tomato paste and turtle soup; also in tomato dishes, cooked peas, squash, and string beans.

Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Summer savory	Southern Europe.	Leaves of an annual plant resembling thyme in odor. Less strong than thyme. Used fresh or dried.	Said to be governed by Mercury and was supposed to belong to the satyrs. Savory is mentioned in the Old Testament. Probably introduced into Britain by the Romans.	Used for flavoring soups, entrées, pork pies, and meat or poultry stuffing, also in lamb cookery. Added to green beans.
Tarragon	Western Asia.	Pungent aromatic leaves of a plant.	Native of Russia and temperate Asia. Is closely related to wormwood.	Used for flavoring mustard, pickles, sauces, salads, soups, and in making "tarragon vinegar." One half pound green tarragon will flavor fifty or more gallons of vinegar.
Thyme	France, North Africa, Spain.	Top and leaf of a garden herb. Used fresh or dried.	Used long before Caesar invaded Gaul, where it was found growing.	Seasoning soups, vegetable and casserole dishes, meats and poultry. When mixed in equal proportions with curry powder forms an ideal clam chowder spice.

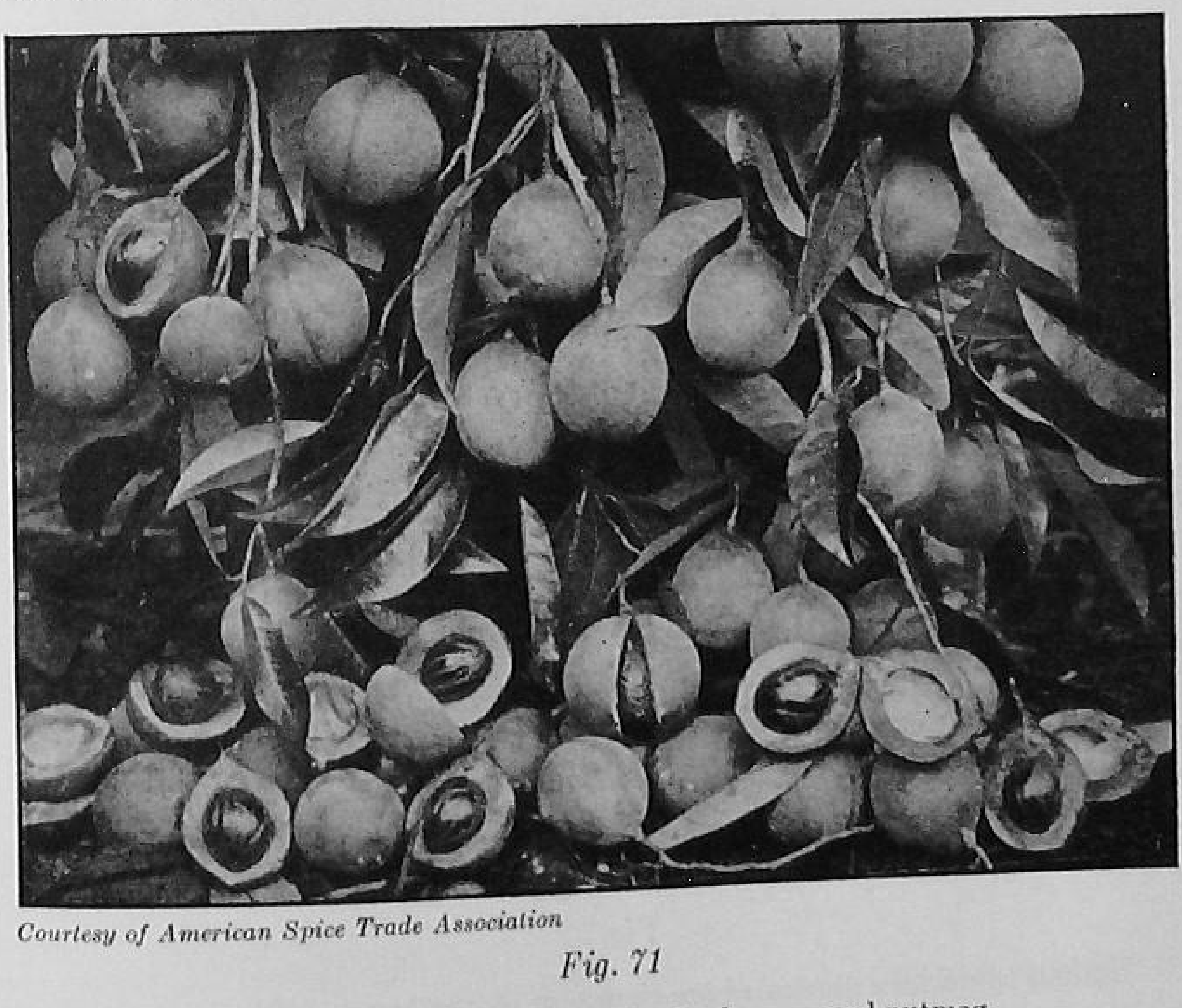
Table 44. (continued)

Name of Spice or Herb	Main Sources of Supply	Description	Historical Background	Common Usage
Tonka bean	Guiana.	Seeds of a large tree. The almond-shaped pod contains a single kidney-shaped bean, dark brown in color. The active principle of the tonka bean is coumarin.	The peculiar odor of Swiss Scabzieger cheese is due to coumarin. It also gives the pleasant aroma to the May wine of the Germans.	The beans or the coumarin extracted from them are often used in making imitation vanilla extract.
Turmeric	Southern Asia.	Rhizome of perennial plant. Contains a yellow coloring matter and has a warm bitterish, somewhat aromatic taste.	Long used in India and Malaya. Brought into use in England and Europe as contact with India grew.	Used for coloring and flavoring. Important ingredient in curry powder.
Vanilla	Indigenous to Mexico but also cultivated in West Indies, Central and South America.	Best beans of commerce are from twenty to twenty-five centimeters long, dark brown in color, and waxy to the touch. Delicious flavor developed in process of sweating or curing.	Mexicans were using vanilla as a flavoring agent long before Europeans discovered America. Montezuma showed a marked appreciation for its fragrant delicacy.	Alcoholic extract widely used in flavoring desserts, as ice creams, cakes, cookies, pastries, and puddings.

Spices contain volatile materials known as essential oils which give them their characteristic flavor and odor. Because these materials are volatile, spices become stale on standing exposed to the air and lose their valued flavor and odor. For this reason, many spice containers are equipped with shaker tops.

In its botanical sense, the term "herbs" is a broad one. For practical purposes, however, we have come to think of herbs as those plants whose leaves, stems, or seeds have culinary or medicinal value. "Flavor," a famous gourmet once said, "is the soul of food." He should have gone one step farther, adding, "and herbs are the soul of flavor." Historical records give evidence of the use of herbs in early times. Theophrastus, Pliny, Aristophanes, Virgil, and Horace wrote of the use of herbs. Such fragrant plants as mint, rue, and cumin are frequently mentioned in the Bible.

In colonial days herbs held a place of distinction. There was hardly a home without its herb garden in which could be found sage, mint, thyme, savory, and other herbs now nearly forgotten. Recently there has been a revival of interest in herbs, as it is realized that their subtle flavors have



Courtesy of American Spice Trade Association

Fig. 71

The nutmeg fruit supplies both mace and nutmeg.

often been lacking in modern cookery. Many of the savory herbs should have a place in the home garden. Those easily grown from seed are: sage, dill, parsley, chives, thyme, basil, savory, mint, and marjoram. Table 44 contains a brief description of many of the spices and herbs important in obtaining quality in food preparation.

Extracts

Flavoring extracts as ordinarily known are alcoholic solutions of true extracts or essences of their chemical duplicates.

Courtesy of American Spice Trade Association

Fig. 72

Various spices here illustrated are cinnamon (in the tray held by the native) and in the trays on the ground: mace (top), cloves (center), nutmeg (bottom).

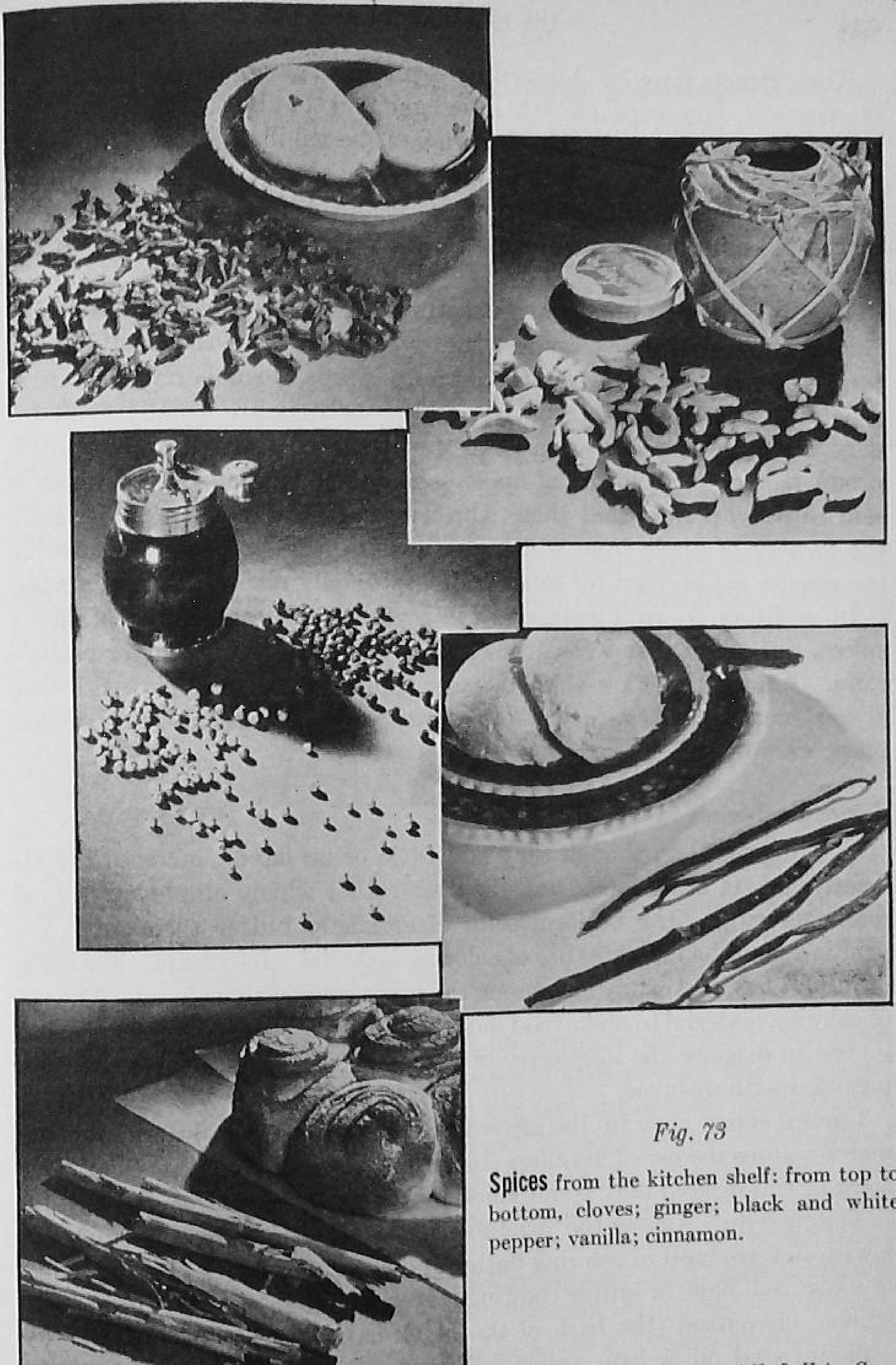


Fig. 73

Spices from the kitchen shelf: from top to bottom, cloves; ginger; black and white pepper; vanilla; cinnamon.

Courtesy of H. J. Heinz Co.

The extracts may be obtained by *expression*, *absorption*, *distillation*, or *maceration*. Lemon peel is so high in lemon oil that it may be successfully expressed from the rind. The flavoring of the vanilla bean is obtained by steeping the cut bean in alcohol. The alcohol absorbs the flavor from the bean. The oils of peppermint and spearmint obtained by distilling the macerated mint leaves are much stronger than the alcoholic extracts.

It is practical to obtain a concentrated extract of only a few fruits. Among these are lemons, oranges, and vanilla-beans. Other fruit flavors, such as apple, apricot, banana, currant, grape, loganberry, nectarine, peach, pineapple, plum, raspberry, and strawberry are usually available only as synthetic preparations. In the course of research on new apple products, a water solution of apple essence has been developed which is said to be so perfect that those who know apples can tell from its taste the variety of apple from which it is made. The process of recovering the essence is also used for other fruits, especially raspberries and grapes.

In addition to fruit extracts, the aromatic characteristics of many spices, nuts, herbs, and some flowers are available in extract or essence form. Among these are almond, anise, celery, cinnamon, cloves, coffee, ginger, maple, nutmeg, orange-flower, peppermint, pistachio, rose, violet, black walnut, and wintergreen.

Coloring materials

Coloring matters, though they add little or no flavor, increase the attractiveness of some foods, and they are rather widely employed in food manufacturing. The uniform color of creamery butter throughout the year is due to the judicious use of coloring material. Ice cream, cake icing, gelatin dishes, and candy are among the foods frequently colored. The use of coloring material to make food more attractive is entirely legitimate, but its use to disguise the inferiority of a product is a questionable practice, regarded with disfavor.

Careful supervision by the government of foods sold in interstate commerce assures the use of harmless coloring materials only. Practically any color or tint desired may be obtained by the use of vegetable and coal-tar or aniline dyes. Among the vegetable sources of colors are annatto, a yellowish-red dye used in coloring butter and cheese; archil (a lichen), source of violet red, blue, or purple coloring material; indigo, a blue coloring substance; quercitron (the bark of the black oak), source of a yellow dye; safflower-seed oil, a light yellow oil frequently used as a substitute for saffron; saffron, a highly potent source of the orange-red color; spinach, the

juice of which is used as a green coloring material; and turmeric, both the yellow powder and the oil extracted being used as coloring materials. Carmine is obtained from the female cochineal, a small insect found on cacti in Mexico, Peru, and several Mediterranean countries. The color is a brilliant red and is one of the oldest of those now used. Caramel, obtained by the heating of sugar, is used to give a dark brown color.

Monosodium glutamate

In recent years monosodium glutamate, the sodium salt of glutamic acid prepared from wheat, soybeans, and the waste of the sugar beet has been given much publicity. This is probably essentially the same material long used by oriental peoples to improve the acceptability of many of their dishes. It is said to improve the flavor of a wide variety of vegetables and meats and even to suppress undesirable flavors. There is not complete agreement among workers as to the benefits of adding monosodium glutamate to a food. It seems highly probable that each person may react differently and that it may be a desirable addition for some, undesirable for others and make no difference at all to a great many.

Leavening Agents

A leavening agent, sometimes called leaven, is used to make foods light. Three common leavening agents in rather wide use are steam, air, and carbon dioxide gas. Other gases such as ammonia have limited use.

It is not known when leaven was first used to lighten bread, but the Egyptians are given credit for the first accounts of it. Joseph, who probably ate unleavened bread in Shechem, ate leavened bread in an Egyptian prison. The Greeks and Romans made bread with leaven. They prepared a ferment by making a batter of bran and fermenting cider and letting it sit in the sun until it was dry, after which it could be kept any length of time. When needed, it was soaked in water and mixed with flour.

It is not known when methods other than fermentation were first used for leavening. In 1602 the Paris apothecaries were given the monopoly of the sale of gingerbread, which indicates that chemicals were used in making it. In a household *Scrap Book* by Queen Victoria, there is included a recipe of Charles II (1660–85) for gingerbread in which the only leavening is "ye yolks of eight fresh and large eggs."

Barm (yeast), a leaven known now as "sponge," and beaten egg whites

are the only leavening agents used in the recipes in a number of English recipe books published from 1769 to 1806. Eight to twelve eggs were used to leaven one pound of flour.

One of the earliest types of leavened bread was known as aerated bread. In its preparation, neither baking powder nor yeast was used. Instead, flour and water were mixed under a pressure of from 40 to 200 pounds and charged with carbon dioxide. After the pressure was released, the dough was placed in pans. With the removal of the pressure and with the heat of the oven, the carbon dioxide expanded and produced a leavened loaf which, though popular in England, met with little favor in Germany and America. Carbon dioxide, produced in food leavened by yeast, soda, and baking powder, ranks as the chief leavening agent, but there are some foods in which leavening is accomplished by steam or air.

Steam

Steam is most effective in leavening batters. It is the principal leavening agent in popovers and cream puffs. Steam is obtained by the vaporization of moisture in products. During cooking most flour mixtures reach a temperature high enough to vaporize a portion of the liquid. Since

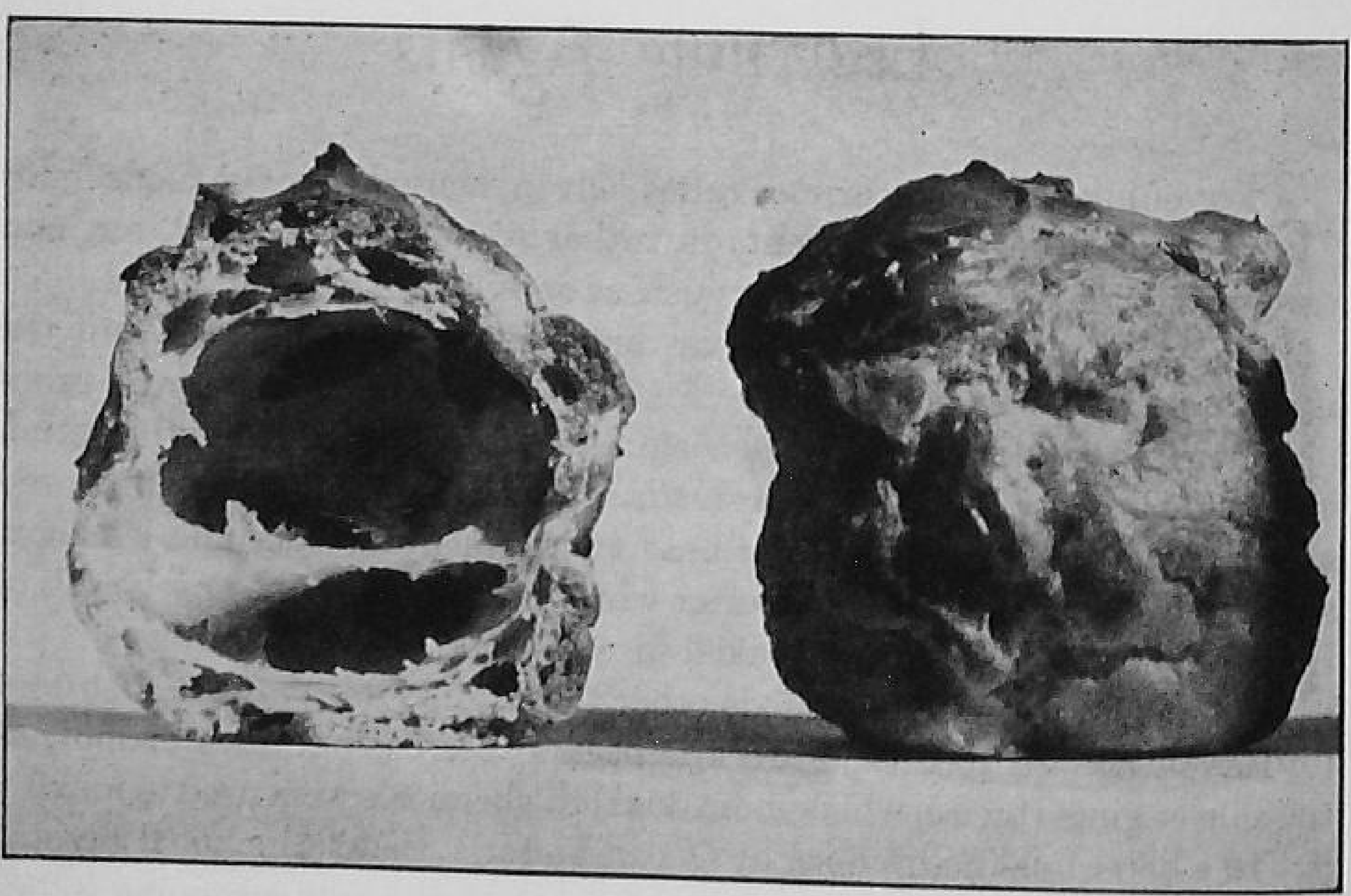


Fig. 74

Standard cream puffs have large cavities to permit use of a generous amount of filling.

vaporized water may give from 1600 to 1800 times its original volume, vaporization results in the expansion of the mixture, and the product becomes proportionately lighter. The proportion of liquid to flour in the mixture affects the degree of leavening possible by steam. In contrast to batters, doughs contain such a small proportion of liquid that its vaporization has little leavening effect.

Air

Air beaten into the mixture or incorporated into the ingredients is the chief leavening agent of some products and is important in others. Air beaten into egg whites is the principal leaven of omelets, soufflés, and sponge cakes, and is of value in waffles and such butter cakes as have beaten egg whites added. The whites and yolks of the eggs beaten together, or egg yolks alone, have little leavening effect.

Air introduced into flour by sifting may be of some small value, and that combined with the creamed fat and sugar mixture may also be helpful.

Carbon dioxide

Yeast. Carbon dioxide, the chief leavening agent, was probably first obtained from yeast, a microscopic plant that grows readily under favorable conditions. Sugar is a food for yeast, and from it the tiny yeast plants produce carbon dioxide. For household purposes yeast may be purchased in dry cake, dry granular, and compressed forms. Dry yeast in cake form is yeast mixed with cornmeal and then dried. The yeast is in a dormant state and hence has good keeping qualities. Some little time is required after the yeast is placed in the liquid in the presence of food to renew the activity of the yeast cells or plants. For that reason the sponge method is most often used with dried yeast in the cake form. A granular dry yeast now available is used as compressed yeast is used, but because of its low moisture content it has much better keeping quality. It may be kept for several weeks without refrigeration and still longer if kept in a cold place. Compressed yeast is a moist mass of yeast mixed with a certain amount of cornstarch. It is perishable and should be kept in a cold place until ready to use. Even then it is best to use compressed yeast when it is fresh. Good compressed yeast is grayish or gray-tan in color, is rather brittle, and breaks sharply. When the cake becomes brown on the edges, the yeast plant is sure to be less vigorous. Compressed yeast is in active form, and, when added to a batter, it grows much more quickly than dry cake yeast.

"Starters" are used in many homes as an inexpensive means of securing leavening. The starter consists often of a portion of bread sponge to which

sugar is added as a food for the yeast. If kept cold, it may remain in good condition for a week or even longer. There is danger of contamination with wild yeasts which give a disagreeable flavor; hence, the starter must be renewed frequently.

Regardless of the form of yeast used, certain conditions are most favorable to its development. Yeast, being a plant, is sensitive to heat and cold. Heat destroys it. It grows readily at a temperature of 23° to 38° C. (74° to 100° F.). A temperature of about 27° C. (82° F.) is generally considered satisfactory for the fermentation of yeast bread. Although cold retards the growth of yeast, even freezing for a short time does not destroy it. Food, moisture, and oxygen are essential for the development of yeast. Sugar is an essential yeast food. This may be either sugar added as such or that produced by the hydrolysis of starch. Sucrose, maltose, glucose, or fructose may be used by the yeast plant, although carbon dioxide is produced most rapidly from glucose or fructose. Hence, molasses added to bread sponge may cause it to rise more quickly than cane or beet sugar. An enzyme in yeast, zymase, is responsible for the breaking down of simple sugars to yield carbon dioxide. Alcohol is formed in the process but is driven off by the heat of baking. Other enzymes in yeast, maltase and sucrase, hydrolyze maltose and sucrose respectively to simpler sugars. Still another enzyme found in flour, and possibly in yeast, diastase, may hydrolyze the starch of flour to maltose,[1] which in turn may be changed to carbon dioxide and alcohol. Products containing yeast have a peculiar flavor and texture which cannot be obtained by other means.

The use of yeast as a leavening agent requires considerable time, which is often an objectionable feature. However, the proportion of yeast used has a decided effect upon the rate of carbon dioxide production. By using large quantities of yeast it is possible to make bread that requires a rising period of only one hour. The danger of using such large quantities of yeast is that the conditions will not be just right and an "off flavor" may develop, giving an unpalatable product. The use of large quantities of yeast increases and may even double the cost of a loaf of bread. Bread made with moderate quantities of yeast may be prepared in a short time if conditions are favorable. Two-hour bread that does not have an exceedingly high yeast content has been made successfully.

Baking soda. The time involved in the use of yeast no doubt led to the

[1] Hydrolysis of starch results in the breaking down of starch to dextrin to maltose to glucose.

Starch (diastase) ⟶ dextrins (diastase) ⟶ maltose (maltase) ⟶
glucose (zymase) ⟶ carbon dioxide + ethyl alcohol

search for a quicker source of carbon dioxide. Sodium bicarbonate (baking soda) yields carbon dioxide when heated. The residue, however, is sodium carbonate, an alkali, which gives a disagreeable flavor and often a yellow color to the food.

$$\underset{\text{Soda}}{2NaHCO_3} + \text{heat} \longrightarrow \underset{\text{Sodium carbonate}}{Na_2CO_3} + \underset{\text{Water}}{H_2O} + \underset{\text{Carbon dioxide}}{CO_2}$$

The need, then, was for a substance which would react with the soda and leave a neutral residue. It is not known when sour milk was first used with soda, but it has been used with more or less success for many years. The sour milk, if used in the right proportions, neutralizes the soda, and leaves a neutral salt which is not unpalatable. Sour milk varies greatly in acidity, and, for that reason, the right proportions are difficult to determine. Milk that is just "turned" neutralizes very little soda, whereas milk that is very sour will neutralize several times as much. The general rule is one half teaspoon of soda to one cup of average sour milk, though the amount of soda is modified depending upon the sourness of the milk. There is more danger of adding too much soda than too little. If the sour milk is not completely neutralized the flavor may not be objectionable, but too much soda gives a bitter flavor and will, in most cases, cause yellow spots in the product.

Molasses and soda have also long been used together as a source of leavening. The acidity of molasses varies greatly, but about three fourths of a teaspoon of soda to one cup of molasses is the average amount used. Too much soda is not as evident when used with molasses, which has a strong flavor, as when used with sour milk.

In older recipes the soda was usually added to the sour milk or to the molasses. This practice results in considerable loss of leavening. Maximum leavening is obtained when the soda is sifted with the flour. However, if the soda is coarse or lumpy it is better distributed in the batter or dough if dissolved in hot water. This gives less loss of leavening than does dissolving it in the acid substance.

Cream of tartar is also used with soda. Cream of tartar is an acid salt of tartaric acid. It does not vary in strength as does either sour milk or molasses, and hence in that respect is more satisfactory. By measure, about 2¼ teaspoons of cream of tartar will neutralize 1 teaspoon of soda, but it is difficult to combine the two thoroughly so that complete reaction results.

Baking powder. Just when baking powders originated is not known, though the first one was patented in 1837. It was composed of hydro-

chloric acid and soda. Early baking powder was not as convenient as that used today, for the two ingredients came wrapped in separate packages and the homemaker measured a portion of each and added them to the batter or dough. Later two cans were used; the one containing the soda fitted into the larger one containing an acid salt.

In 1884 a second baking powder, known as Horsford's Bread Preparation, was patented. This might really be said to be the beginning of modern baking powders, for the acid used was monocalcium phosphate, one of the common acid ingredients in baking powders today. Not until 1893, almost the beginning of the twentieth century, were the materials mixed together with cornstarch, packed in a tin can, and labeled baking powder.

Baking powder produces carbon dioxide more quickly than does yeast, so is used for the so-called hot or quick breads. Today, as in 1893, it is made of soda, an acid salt, and starch. In the presence of moisture the acid neutralizes the soda, which acts as a base. The carbonic acid thus formed breaks up immediately to give water and carbon dioxide. Even a trace of moisture permits the reaction to take place. Starch in the baking powder absorbs moisture that may be present during storage and thus delays or prevents deterioration.

During the development of baking powders various acids have been tried, but only four, cream of tartar, tartaric acid, calcium acid phosphate, and sodium aluminum sulfate, are in wide use today. One or more of these are used in practically all baking powders. Three types of baking powder, each characterized by the acid used, are common on the market. These are the tartrate, the phosphate, and the sodium aluminum sulfate-phosphate baking powders.

Tartrate powders depend upon tartaric acid and cream of tartar for their reactivity. Cream of tartar alone may be used, but cream of tartar and tartaric acid together are more satisfactory. The following equations express the chemical reaction of a tartrate baking powder when moistened:

For cream of tartar:

$$KHC_4H_4O_6 + NaHCO_3 \longrightarrow KNaC_4H_4O_6 + CO_2 + H_2O$$

$KHC_4H_4O_6$	$+ NaHCO_3 \longrightarrow$	$KNaC_4H_4O_6$ +	CO_2 +	H_2O
Cream of tartar or Potassium acid tartrate	Soda	Potassium sodium tartrate	Carbon dioxide	Water

For tartaric acid:

$$H_2C_4H_4O_6 + 2NaHCO_3 \longrightarrow Na_2C_4H_4O_6 + 2CO_2 + 2H_2O$$

$H_2C_4H_4O_6$	$+ 2NaHCO_3 \longrightarrow$	$Na_2C_4H_4O_6$	$+ 2CO_2$	$+ 2H_2O$
Tartaric acid	Soda	Sodium tartrate	Carbon dioxide	Water

In the phosphate powders, the acid used is calcium acid phosphate which when moist may give the following reaction:

$CaH_4(PO_4)_2$	$+ 2NaHCO_3 \longrightarrow$	$CaHPO_4 +$	Na_2HPO_4	$+ 2CO_2$	$+ 2H_2O$
Monocalcium phosphate	Soda	Dicalcium phosphate	Disodium phosphate	Carbon dioxide	Water

The S.A.S.-phosphate or the sulfate-phosphate baking powder, often referred to as "combination" or "double-acting" baking powder, contains both sodium aluminum sulfate and monocalcium phosphate. The monocalcium phosphate reacts with the soda as soon as the two are moistened. Only when heat and moisture are applied does the sodium aluminum sulfate react with the soda. Hence, the baking powder containing these is termed "double-acting." The reaction for monocalcium phosphate has just been given. Sodium aluminum sulfate, with the application of heat in the presence of moisture, gives the following reaction:

$2NaAl(SO_4)_2$	$+ 6H_2O + \text{heat} \longrightarrow$	Na_2SO_4	$+ 2Al(OH)_3$	$+ 3H_2SO_4,$
Sodium aluminum sulfate	Water	Sodium sulfate	Aluminum hydroxide	Sulfuric acid

$3H_2SO_4$	$+$	$6NaHCO_3 \longrightarrow$	$3Na_2SO_4$	$+$	$6CO_2$	$+$	$6H_2O$
Sulfuric acid		Soda	Sodium sulfate		Carbon dioxide		Water

or

$2NaAl(SO_4)_2$	$+ 6NaHCO_3 \longrightarrow$	$4Na_2SO_4$	$+ 2Al(OH)_3$	$+ 6CO_2$
Sodium aluminum sulfate	Soda	Sodium sulfate	Aluminum hydroxide	Carbon dioxide

Although other types of baking powder are manufactured, their use is limited.

Each type of baking powder has a characteristic reaction time and so may give quite different results from the others with the same method of mixing. Experimental work shows that when moistened the tartrate baking powder liberates the highest percentage of carbon dioxide within a given time, the phosphate the next highest, and the S.A.S.-phosphate the lowest percentage loss of the three common types. Because of its lower loss of carbon dioxide, S.A.S.-phosphate baking powder may be successfully used in smaller amounts than the other two types.

The general rule for leavening with baking powder is 1½ to 2 teaspoons of the quick-acting (tartrate and phosphate) and 1 to 1½ teaspoons of the slow-acting powders (S.A.S.-phosphate) to each cup of flour. The smaller

quantities are usually sufficient for cakes, but the larger amount is often preferred for quick breads. If several stiffly beaten egg whites are used, the proportion of baking powder is reduced. A rule sometimes given is to reduce the baking powder one half teaspoon for each egg white added, but this is by no means generally accepted. The quantity of baking powder is often not reduced unless four or more egg whites are used.

Sometimes it is necessary or desirable to use sour milk in a recipe with proportions given for sweet milk or to use sweet milk instead of sour. The substitution of sour milk for sweet milk involves changes in the kind and amount of the leavening agent, but may be easily and quickly done if certain rules are observed:

One half teaspoon of soda neutralizes one cup of average sour milk (clabbered).

One teaspoon of soda is equivalent in leavening power to four teaspoons of quick-acting baking powder.

In modifying a recipe using sweet milk so that sour milk may be used, it is necessary to

1. Determine the amount of soda required to neutralize the sour milk.
2. Multiply the obtained amount of soda by four to get the equivalent of baking powder.
3. Subtract the equivalent of baking powder obtained in step (2) from the amount of baking powder called for in the recipe.
4. Substitute quantity of soda obtained in step (1) plus the quantity of baking powder obtained in step (3) for the baking powder in the original recipe.

Flour Mixtures

Flour mixtures in one or more of the many varieties have an important rôle in the dietary of the American people. The quality of these many products varies greatly, both among varieties and also within any given variety.

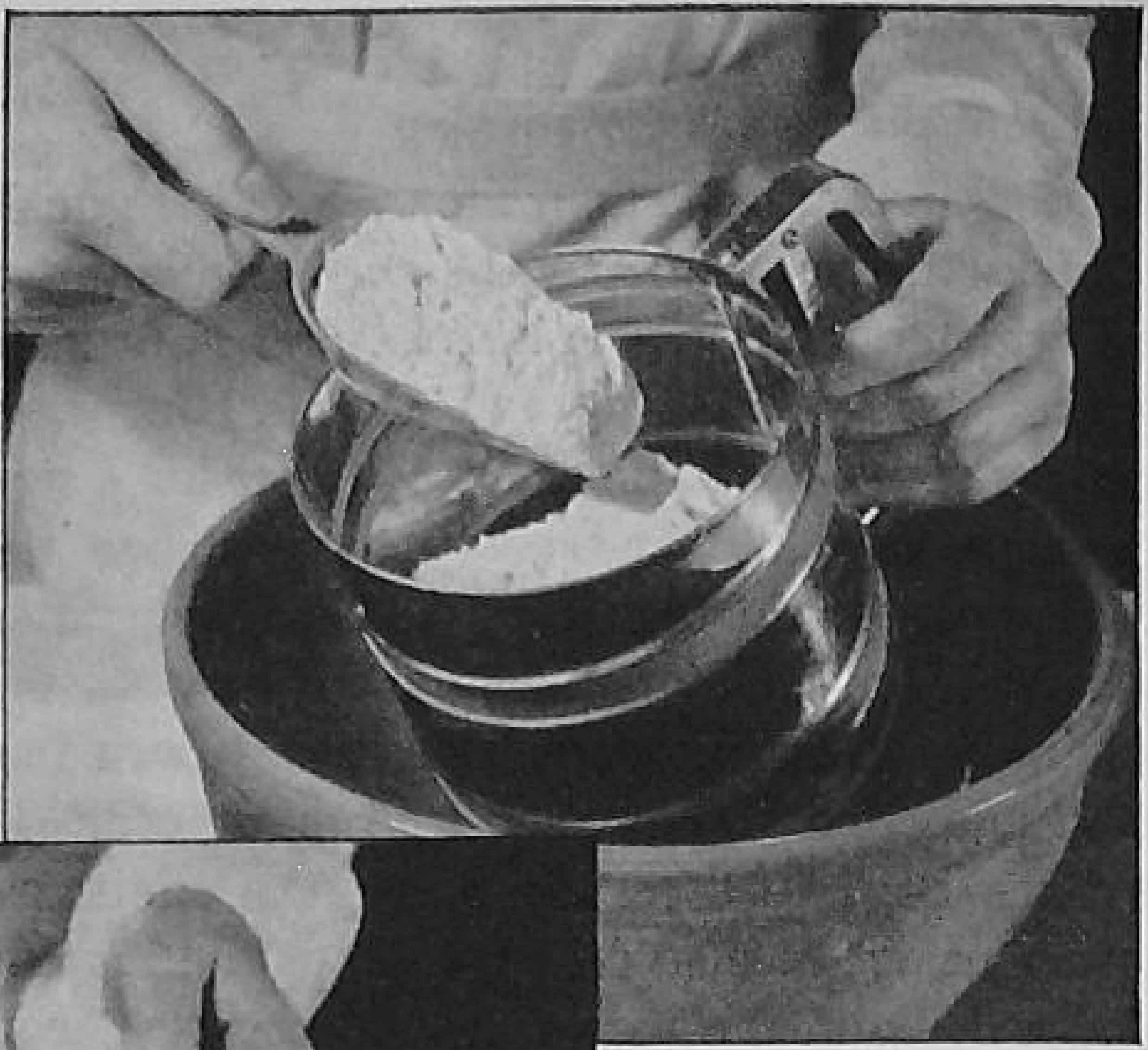
The quality is judged by the exterior and interior appearance of the product as well as by its flavor and odor. When the exterior appearance is considered, the shape, size, color, and thickness of the crust are noted. When the interior is considered, points to be observed include the crumb, whether moist or dry; the texture, whether tender or tough; the grain, whether even or uneven, fine or coarse; and the color.

Factors affecting quality: Measuring

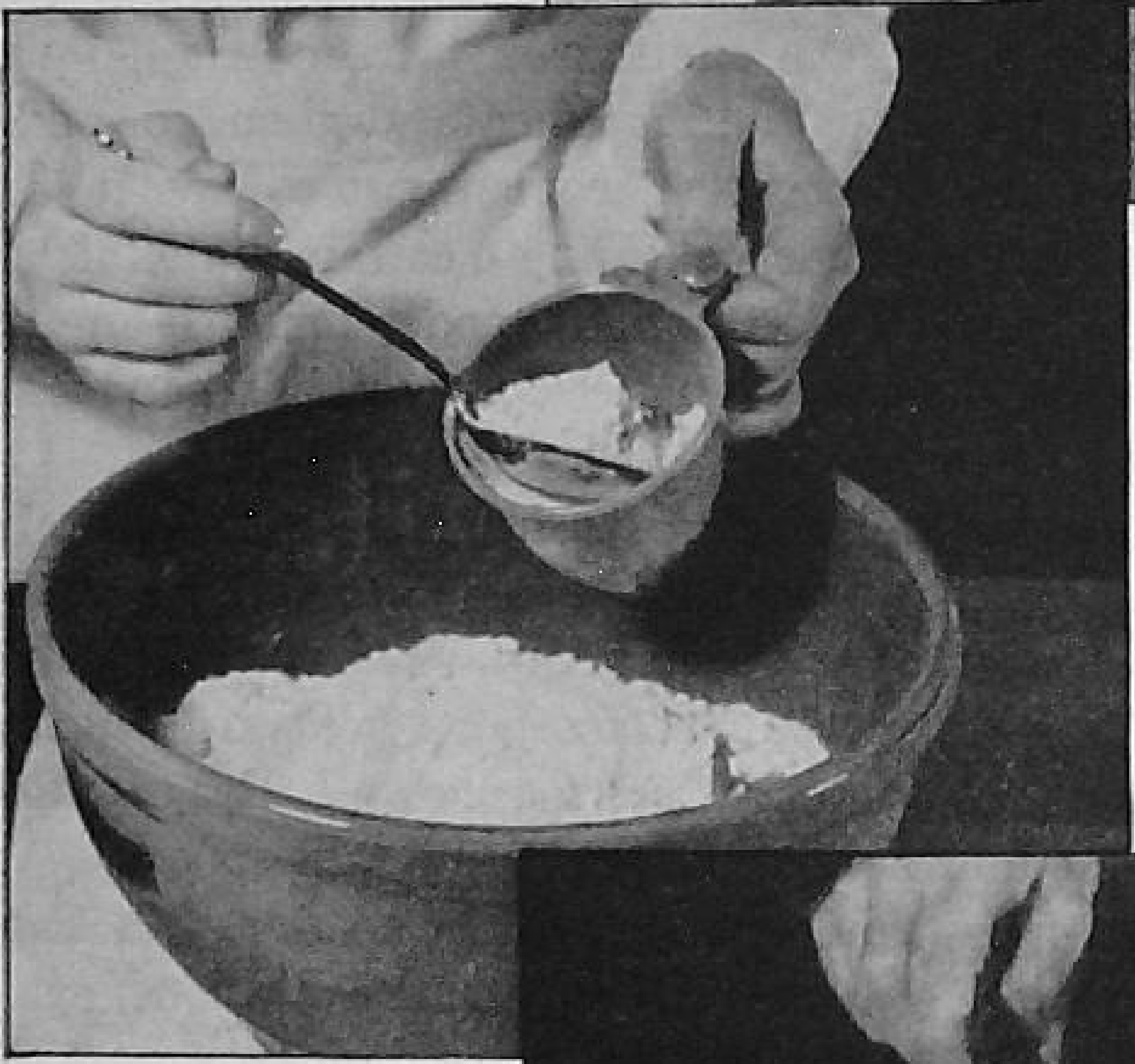
Success in obtaining flour mixtures of high quality depends upon a variety of factors. Obtaining the correct amount of the ingredients to be used, which involves accurate measurements, is necessary. Various methods are employed to this end. Some homemakers merely estimate the quantity of each ingredient used; others have strange and unstandardized measuring utensils; and some acknowledge the necessity of accurate measurements and use standard measuring utensils. One woman who makes delicious biscuits, when asked how she made them, replied, "You can't make them except in this little brown bowl." The "little brown bowl" had come to be her measuring utensil. The right amount of flour filled the bowl to a certain mark, the addition of fat brought it up to another mark, and so on until all of the ingredients were added, and a definite amount of dough resulted. Another woman possesses teacups of varying shapes and sizes, each used for measuring a certain material. In such case, breaking a cup means that the light tender muffins, once so much prized, are no longer possible until practice again establishes a means of measuring.

The use of standard measuring utensils is an infinitely more desirable practice. The measuring cup which holds one fourth of a quart or 236.6 cubic centimeters has been selected as the standard. The standard tablespoon holds one sixteenth of a cup, and the teaspoon holds one third of that tablespoon. However, many utensils are inaccurate. For example, often the place marked one fourth cup holds only two tablespoons. Approximately fifty different measuring cups are on the market. Of these comparatively few are accurate either in the unit or the divisions. It is well before purchasing utensils to determine whether or not they meet the specifications for standard capacity. This may be done either by consulting an approved list or by testing them, using a standard utensil.

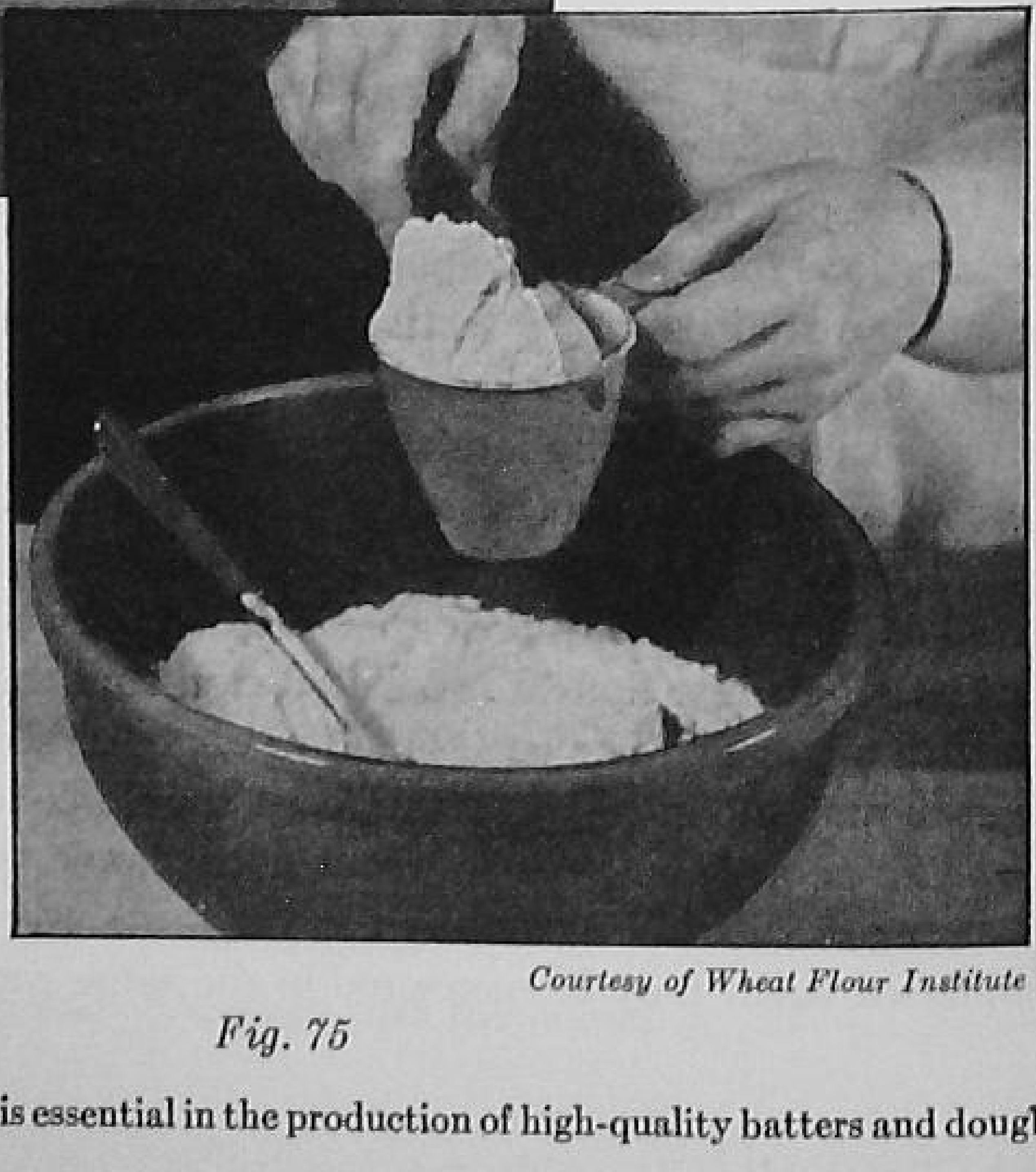
Each ingredient should be measured as accurately as possible. Liquids are measured by pouring into the measuring utensil until it is level full or, if only a fraction of the measure is desired, until the liquid reaches the desired mark. The measuring utensil should always be held level. Repeated experiments show that more nearly uniform results can be obtained in measuring white flour if it is sifted once and then filled lightly into the cup with a spoon. The cup should never be shaken or jarred in an effort to get in more flour. After it is filled it should be leveled off with the edge of a knife or spatula. Whole wheat flour should be stirred but not sifted. Otherwise it should be measured in the same way as white flour. White granulated sugar may be measured in the same way as whole wheat flour.



A. Sift once.



B. Pile lightly into measuring cup.



C. Level top with edge of spatula.

Courtesy of Wheat Flour Institute

Fig. 75

Correct measurement of flour is essential in the production of high-quality batters and doughs.

Brown sugar should be rolled, if there are any lumps, then packed tightly into the cup so that, when it is turned out, it will hold its shape. Leavening agents and other dry ingredients used in small quantities are measured by dipping a heaping spoonful from the container and leveling it with the edge of a spatula. Baking powder is generally stirred before measuring, and soda, if lumpy, may be sifted. Solid fats may be packed tightly into the cup or spoon, leaving no air spaces, and leveled off with a spatula, or they may be measured by the displacement method. In this method cold water is placed in a cup, leaving space equivalent to the amount of fat to be measured. Fat is added to the cup until the water and fat reach the one cup level. The water is then drained off. Liquid fats are measured as other liquids. Since eggs vary widely in size, it is usually best to select those of average size.

Even with the most careful measuring possible, inaccuracies do occur. Much more uniform and satisfactory results are obtained by weighing. Because most recipes are given in volume rather than in weight, and because the average household is not equipped for weighing small quantities accurately, it is probable that the weighing of materials for making food products in the home will not become a common practice in the near future.

Ingredients

The purpose in either careful measurement or exact weighing of ingredients is to secure the correct ratio. Formulas or recipes have been evolved that express the ratios of ingredients found to produce desirable products for each of the various types of flour mixtures. For any one of these types, however, the exact ratio between the flour and the liquid will vary with the kind of flour used. Hard and soft wheat flour take up different amounts of liquid. Good bread flours from hard wheat usually take up 60–65 per cent of the weight of the flour in water. Soft wheat flours which have weaker gluten take up a lower proportion. One flour may not be satisfactorily substituted for another without making other changes. In many recipes the use of a definite flour is indicated. Cake flour is particularly adapted for use in cakes. Hard wheat or bread flour, as a rule, gives best results in making yeast bread. Family or general purpose flour is satisfactory for quick breads and is probably the type most used for making yeast breads in the home. Even the same class of flour varies in different parts of the country and in different years. Generally several brands of each class are available. A person may select one for continued use after testing several brands. In making such a choice, any difference in cost as well as the difference observed in the quality of the product

should be given consideration. The flour forms the structure or the framework of the finished product, although this structure may be greatly altered by other ingredients present.

The liquid used in flour mixtures is generally either milk or water. Milk is usually preferred because of the greater food value and the possible effect it may have on the flavor and the browning of the product. When milk is used the proportion of liquid is, as a rule, slightly higher than when water is used. Milk contains about 13 per cent solids, so has less thinning power. The liquid hydrates the flour and acts as a solvent for sugar, salt, and proteins. It is necessary for the release of carbon dioxide from the baking powder.

Too much liquid or too little flour results in a thin mixture that may give a product which spreads too much, is soft, moist, sometimes even soggy, and which tends to fall. The product that contains too little liquid or too much flour is characterized by a dry, harsh texture. It is often uneven in shape due to failure to spread and difficulty in handling.

Fats are added primarily to improve the flavor, the texture, and the keeping quality of the product. Any one of the common fats may be used, such as lard, butter, margarine, hydrogenated fats, and the vegetable oils. So long as the fat does not add an undesirable flavor, the average individual cannot detect which kind has been used. However, when an unsalted fat is used, the product is more palatable if a slight increase is made in the quantity of salt added. Except for special recipes, a general preference still exists for a solid fat in the making of pastry, cakes, and similar products. Fat is especially effective in altering the structure of the flour mixture. It may be adsorbed on the surface of the flour particles and other solids and thus may definitely affect the tenderness of the product.

It is sometimes more convenient to use cream than milk and fat. Often cream does not have the same ratio of milk to fat as the recipe calls for. In such a case, it is necessary to add either fat or milk to make up the correct ratio. Before this can be done, the percentage of fat in the cream must be known. Usually it will be either approximately 20 per cent or 40 per cent. For purposes of calculation the "20 per cent cream" is considered one fifth fat and four fifths milk, and the "40 per cent cream" two fifths fat and three fifths milk. Products made with cream are often considered to have a better flavor and texture than those made with milk and fat. This is, no doubt, due in part to the type of emulsion. Eggs add flavor and color to flour mixtures and are effective in giving firmness to the cooked product. They may serve as a means of introducing air into a product if added in the form of stiffly beaten whites, or they may aid in retaining

the steam or the gas produced by the chemical leavening agents. In thin batters, eggs are especially valuable in retaining the leavening agent. They add sufficient body to the structure of the mixture to enable it to hold the steam or gas and allow the product to rise. In some flour mixtures, such as popovers, a solid mass results if no eggs are added. Eggs, although they contain a fair amount of fat and are said to possess some shortening power, tend to counteract the effect of excess fat in a mixture. An increase in fat beyond a certain point may cause the product to fall and be soggy. But if the increase is accompanied by an increase in eggs, falling does not occur, although the grain will probably be too fine and compact. If the eggs are increased without a similar increase in fat, the product becomes rubbery and resilient.

Sugar adds flavor or sweetness to flour mixtures. It gives desirable brownness to the crust partly by reaction with protein and partly by caramelization. In certain products, sugar improves the texture due to incorporation of air during the creaming of sugar and fat. When added in appreciable amounts sugar has a dispersing effect upon the gluten and it raises the coagulation point of the egg. Both are tenderizing effects. It may contribute to the distribution of fat in the batter or dough and thus affect the texture of the finished product. Increasing the sugar materially, especially in cakes, without changing the other proportions will result in coarse, large cells, thick cell walls, and a shiny crust that is crystalline in appearance. The product usually crumbles badly.

The leavening agent affects the lightness and porosity of a flour mixture. Salt adds flavor. Except in the making of yeast bread, it probably has no effect upon the physical characteristics of the product. In yeast bread, a certain amount of salt aids in controlling the development of undesirable microorganisms. Too much salt may interfere with the development of the yeast. Flavoring extracts, nuts, fruits, and other foods are often added to flour mixtures. These modify the flavor, and frequently the texture, in a characteristic manner.

Method of mixing

The method of mixing varies with the proportion of ingredients used. Flour mixtures are classified as batters and doughs and may be further subdivided into pour and drop batters and soft and stiff doughs. Three methods are commonly used for mixing batters, the muffin method, the creaming or conventional cake method, and the quick or "cake-mixer" method. Other methods have a limited use. Methods for mixing doughs are adapted to the product — *e.g.*, the biscuit method, the pastry method,

TABLE 45. CLASSIFICATION OF BATTERS AND DOUGHS ACCORDING TO PROPORTION OF FLOUR TO LIQUID*

Type	Proportions by Volume		Consistency	Examples
	Liquid	Flour		
Pour batter	1 part	1 part (more or less)	Thin enough to pour a steady stream	Popovers, griddle cakes, waffles, and cream puffs
Drop batter	1 part	2 parts (more or less)	Breaks into "drops" when poured	Muffins, fritters, cake, gingerbread, drop biscuits, and drop cookies
Soft dough	1 part	3 parts (more or less)	Soft but can be handled on board	Baking powder biscuits, yeast rolls, and bread
Stiff dough	1 part	4 parts (more or less)	Firm to touch and can be rolled easily on board	Pie crust, noodles, and rolled cookies

* Adapted from **Practical Cookery and the Etiquette and Service of the Table,** Department of Foods and Nutrition, Kansas State College. Published by John Wiley and Sons, Inc.

and the yeast bread method. The methods of mixing are presented in more detail under the type of product to which each is adapted.

The length or amount of mixing exerts an influence. If the mixture is thin, as for griddle cakes and muffins, a few seconds in time or few strokes in mixing may make the difference between a standard and a poor product. With many products, much additional mixing may be required to make a really great difference in quality. Mixing is greatly facilitated by proper utensils. A bowl so full that the contents spill over the sides when stirred, or one so large that the mixture just covers the bottom, hinders proper mixing. One that is about half full allows for the most effective mixing with the least time and effort. A bowl with sloping sides and a rounded bottom is best. For stirring, a wooden spoon with a shallow bowl is good. The wooden spoon is usually easier on the hand and discolors neither the hand nor the mixture as a metal spoon often does; moreover, it does not scratch. If the mixture stands for a time before being cooked, the quality may be injured. Such an effect is, as a rule, more noticeable with the thinner mixtures than with the stiffer ones.

Cooking

Cooking the flour mixture produces a number of changes, including the

production and expansion of the leavening gas, the coagulation of the proteins of the egg and flour, the melting of the fat, gelatinization and probably some dextrinization of the starch, loss of moisture, and melting of the sugar and its caramelization on the surface. Both temperature and length of cooking time affect quality. For each product a rather limited range of temperatures gives best results. This is largely determined by the proportion of ingredients and the size and thickness of the mixture.

Altitude

Unless a person is faced with the problem of preparing a flour mixture at high altitude, he seldom realizes the effect of atmospheric pressure upon the product. As has been mentioned before, flour forms the main structure of the cooked mixture. Eggs tend to strengthen this structure and sugar and fat to weaken it or to make the product tender. Liquid is the medium in which the other ingredients are dispersed or dissolved. If the framework is set when the gas bubbles are still small, the result will probably be a small, uniform grain. If the gas bubbles have expanded excessively, the surrounding cell walls collapse, the bubbles unite to form larger bubbles, and the cell walls are thick. The result is undesirable. The principal effect of altitude is upon the leavening agent. Higher altitudes are accompanied by lower atmospheric pressures. At lower pressures, gas expands much more readily and to greater volume. Water boils at a lower temperature, hence steam is formed sooner. The result is that when a

TABLE 46. CHANGES AT VARIOUS ALTITUDES IN FORMULAE FOR CAKES DESIGNED FOR SEA LEVEL *

(In one-egg cakes, corrections are necessary for baking powder only.)

Ingredient	3,000 feet	5,000 feet	7,500 feet
Reduce sugar................ For each cup, decrease........	No change	Usually no change	1 to 2 tablespoons
Reduce baking powder........ For each teaspoon, decrease ...	⅛ teaspoon	⅛ to ¼ teaspoon	¼ to ½ teaspoon
Increase liquid............... For each cup, add............	1 to 2 tablespoons	2 to 3 tablespoons	3 to 4 tablespoons
Shortening...................	In making very rich cakes, it is sometimes necessary to reduce shortening by 1 or 2 tablespoons.		

* **Handbook of Food Preparation**, American Home Economics Association, 1954.

product is baked at high altitude the tendency is for excessive expansion with accompanying collapse of the framework resulting in a small, heavy product.

Extensive work carried on in states where high-altitude cookery is a problem indicates that certain adjustments in the proportions of ingredients result in satisfactory products, even at high altitudes. In general, batters and doughs are improved by decreasing the proportion of the leavening agent. That is, in mixtures leavened by carbon dioxide obtained from baking powder, the amount of this ingredient is reduced as altitude increases. The proportions of fat and sugar and sometimes of egg may also be altered. A decrease in sugar and fat is made as the altitude increases. Eggs may be increased when they are of importance in retaining steam, as in popovers. The liquid may also be increased because so much steam escapes at high altitudes that more is necessary for effective leavening. In sponge cakes the sugar is generally decreased, although the flour may be increased to give good results with decreased atmospheric pressure. Cream puffs, biscuits, and plain muffins need little if any adjustment in proportions with change in altitude. However, most of the baked products are improved by a slight increase in baking temperature at higher altitudes. This aids in browning the crust and probably in "setting" the framework before excessive expansion of the leavening agent has occurred.

PROBLEM 15 *How shall quick breads be prepared?*

Just when and why hot breads originated is not known, but most countries have their traditional favorite. From Scotland comes the scone and the short breads, and from Germany the coffee cake. Tugby voiced the English preference when he said: "I'm glad we had muffins. It's the sort of a night for muffins. Likewise, crumpets and also Sally Lunn." [1]

In this country hot breads were an important item in the diet of the South previous to the Civil War, and their use is still predominant in that section. They were not widely used in the North until later. It is said, "In the North man may not be able to live by bread alone; but in the

[1] Charles Dickens, *The Chimes.*

South he comes mighty near to it, provided the bread is hot." [1] From the southern states have come, in addition to the recipes, the traditions and the charm of meals including such hot breads as beaten biscuits, spoon bread, and cornbread.

The wide variety found in the hot breads used today results in part from the diversity of cereal products that can be used as flour or meal. For example, cornmeal, bran, rye flour, whole wheat flour, white flour, or oatmeal can be made into muffins, yet these will be quite dissimilar. The nature of the cereal used will characterize the product. Variety is further obtained through changes in the proportions of flour or meal and of liquid used (Table 47, p. 352). The character of these products may vary widely. Methods of cookery may further accentuate the differences by determining the size of the unit, the type of crust formed, and the shape. For example, batter cooked on a waffle iron yields a markedly different dish from batter cooked on a griddle.

Popularity of quick breads

Perhaps the increased information on leavening agents that the last century has brought has been most largely responsible for the present wide use of hot breads. Many centuries ago yeast was used as a leavening agent for both hot breads and those eaten cold. The coarse nature of the flour used, the unexacting standards, and the meager equipment available for food preparation, all postponed any change in the leavening procedure.

Improvements in milling leading to the increased production of fine flours adapted to the making of a fine product led to a change in standards and to interest in a variety of products. The discovery that the meals and flours of certain grains are better suited for use in hot breads than others also contributed to this end. Somewhat later the development of baking equipment with its subsequent widespread use became an important factor in the popularity of hot breads in the average home. In the days when the dough was baked on a hot stone that had been covered with ashes, the hot breads enjoyed today would not have been possible. The perfecting of the regulated oven and the electric waffle iron and grill stimulated the increased use of these breads.

Classification

Quick breads may be divided either according to the leavening used or the ratio of liquid to flour. By the former method of classification there

[1] Blanche S. Rhett, *Two Hundred Years of Charleston Cooking*. Charleston, South Carolina: Harrison Smith and Robert Haas, Inc., 1930. Quoted by special arrangement with the publishers.

are quick breads leavened by steam and those leavened by a chemical agent. Steam-leavened breads are, for the most part, limited to popovers. Breads containing chemical leavening agents include griddle cakes, waffles, muffins, and biscuits. The standard proportions for these various products are given in the following table.

TABLE 47. STANDARD PROPORTIONS USED IN HOT BREADS OF DIFFERENT TYPES

Product	Milk	Fat	Flour	Baking Powder *	Egg	Salt	Addition
Pour batters							
Griddle cakes.	1½–2 c.	2 T.	2 c.	3–4 t.	2	1 t.	
Waffles......	2 c.	3–5 T.	2½ c.	3–4 t.	4	1 t.	
Popovers ...	2 c.	2 T.	2 c.	....	4	¼ t.	
Drop batters							
Muffins.......	1 c.	2 T.	2 c.	3–4 t.	1	1 t.	2 T. sugar
Soft dough							
Biscuits.......	⅔–¾ c.	4 T.	2 c.	3–4 t.	...	1 t.	

* As formerly recommended the smaller amount of baking powder was considered sufficient if a slow-acting powder was used. The larger amount was used if quick-acting powders were selected. Today there is a growing tendency to give only one amount for all types of baking powders.

Quick breads, especially muffins and biscuits, are frequently varied by the addition of other ingredients to the basic recipe.

TABLE 48. VARIATIONS FOR QUICK BREADS

MUFFINS Basic recipe	Any one of the following additions may be made:* ½ c. minced crisp bacon ½ c. minced crisp ham 1 c. grated cheese and ¼ c. milk ½–¾ c. nuts 1 c. apples, chopped fine, ¼ c. sugar, ½ t. cinnamon 1 c. cooked dried apricots, well drained and chopped 1 c. blueberries, drained. Increase shortening to 4 T. and sugar to 4 T. ¾ c. currants ½ c. dates and ½ c. nuts, chopped 1 c. candied orange peel 1 c. raisins Sprinkle with cinnamon and sugar.

* Amounts given are for a recipe using 2 cups flour, 2 tablespoons fat, and 2 tablespoons sugar.

BISCUITS	Any one of the following additions may be made:*
Basic recipe	½ c. grated cheese
	⅓ c. minced crisp bacon
	½ c. crushed potato chips
	4 T. minced chives
	½ c. chopped nuts
	½ c. raisins
	½ c. dates
	1 T. orange marmalade, ⅔ c. orange juice, 1 egg ½ c. chopped nuts. Omit milk.
	¼ t. dry mustard, ½ t. dry sage, 1¼ t. caraway seeds ¼ t. curry powder.

*Amounts given are for recipe using 2 cups flour.

Substitution of ingredients

Substitution of ingredients is common. A separate recipe is unnecessary in order to make such changes if the value of the material to be substituted is known in terms of that which it replaces in the basic recipe. Table 49 presents equivalent values of certain ingredients in the basic recipe for both pour and drop batters.

Combining the ingredients

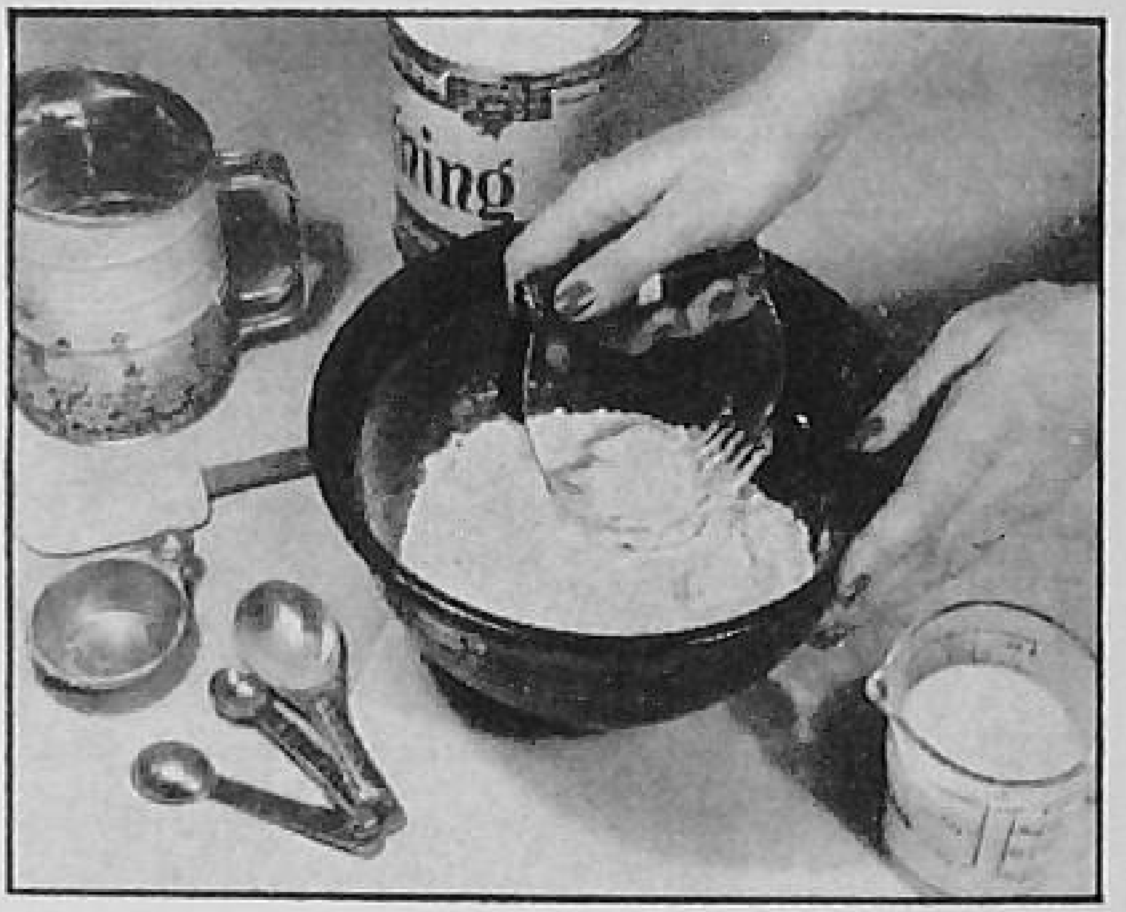
The method of combining the ingredients bears a relation to the character of the product. The muffin method of mixing is satisfactory for breads of the batter class, whether pour or drop. The muffin method follows:

> Sift dry ingredients together into a mixing bowl of suitable size. Make a well in center of flour mixture. Beat eggs, add melted fat and milk (room temperature), combine with eggs. Pour liquids into the well made in the dry ingredients and mix.

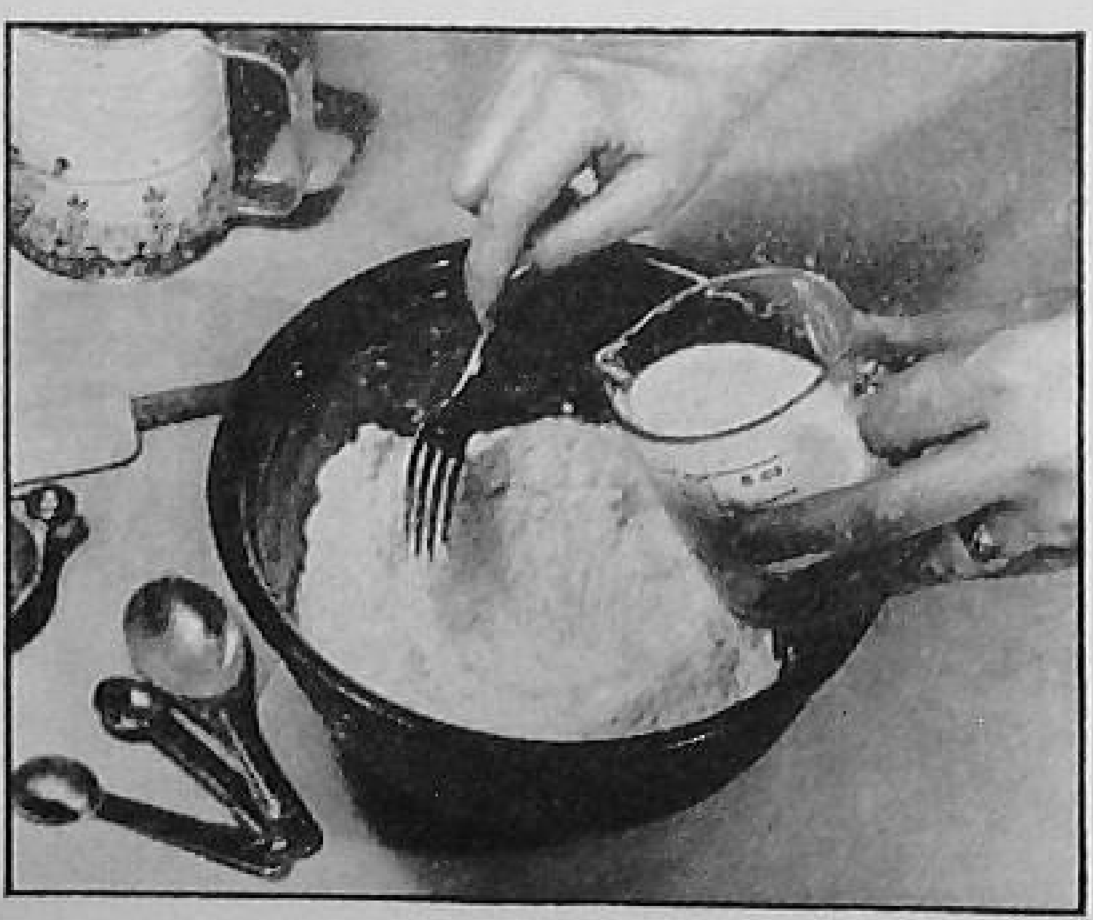
The amount of mixing desirable is influenced by the ingredients and the proportions used. Popovers contain neither baking powder nor soda. They should be mixed thoroughly so that the resulting batter is of such nature as to retain the steam formed during baking. If baking powder or soda is used and the recipe is plain (low in sugar and fat) only enough mixing should be done barely to moisten the dry ingredients. For muffins, approximately fifteen mixing strokes are suggested. Excess mixing results in a product that is tough and heavy with an uneven grain. Tunnels that are long and narrow, usually extending from the bottom toward the top, are frequently found in overmixed muffins. With richer products,

Fig. 76

Baking powder biscuits: Ingredients should be carefully measured.

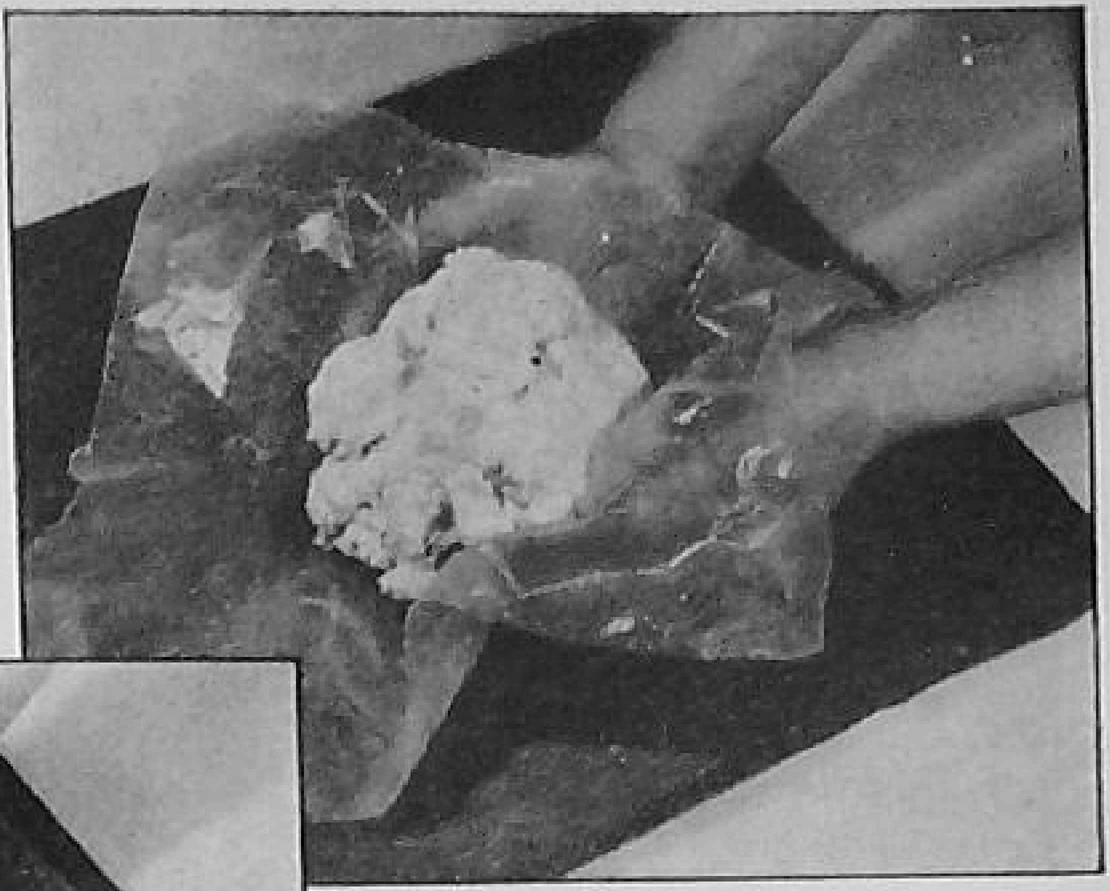


A pastry blender is used to mix the fat with the dry ingredients until it looks like cornmeal.



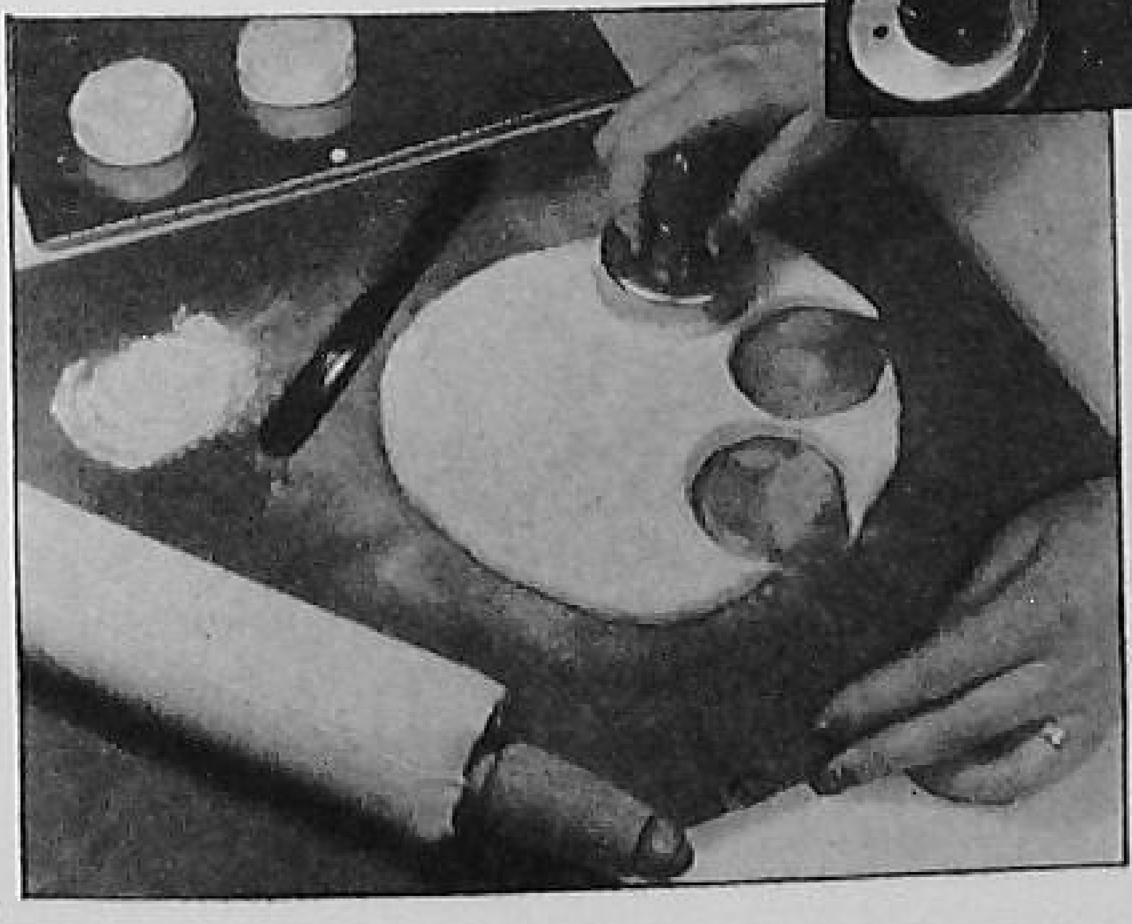
The milk is poured in the hollow made in the mixture and mixed.

The dough, on a piece of waxed paper, is gently pressed into a ball.



The dough is kneaded lightly until velvety smooth.

The dough, on a lightly floured pastry cloth, is rolled with a stockinette-covered rolling pin to about ½-inch thickness.



The biscuits are cut with a 2-inch biscuit cutter which has been dipped in flour.

Courtesy of Swift and Company

TABLE 49. EQUIVALENCE OF CERTAIN INGREDIENTS

Ingredient in Basic Recipe	Equivalent
1 c. family or general-purpose flour *	⅞ c. cornmeal
	1 c. graham flour
	1 c. ground rolled oats
	1 c. barley flour
	1 c. rye flour
	1½ c. bran
	1½ c. bread crumbs
	1 c. cooked cereals
	Rice
	Farina, etc.
1 T. butter	1 T. lard
	Crisco
	vegetable oil
	butter substitute
	2½ T. 40% cream †
	5 T. 20% cream
1 T. granulated sugar ‡	1 T. brown sugar
	1 T. molasses or syrup
	1 T. honey

* Substitution of equivalent ingredients for part of the flour may be made in griddle cakes, waffles, muffins, and biscuits, but should not be attempted in popovers.

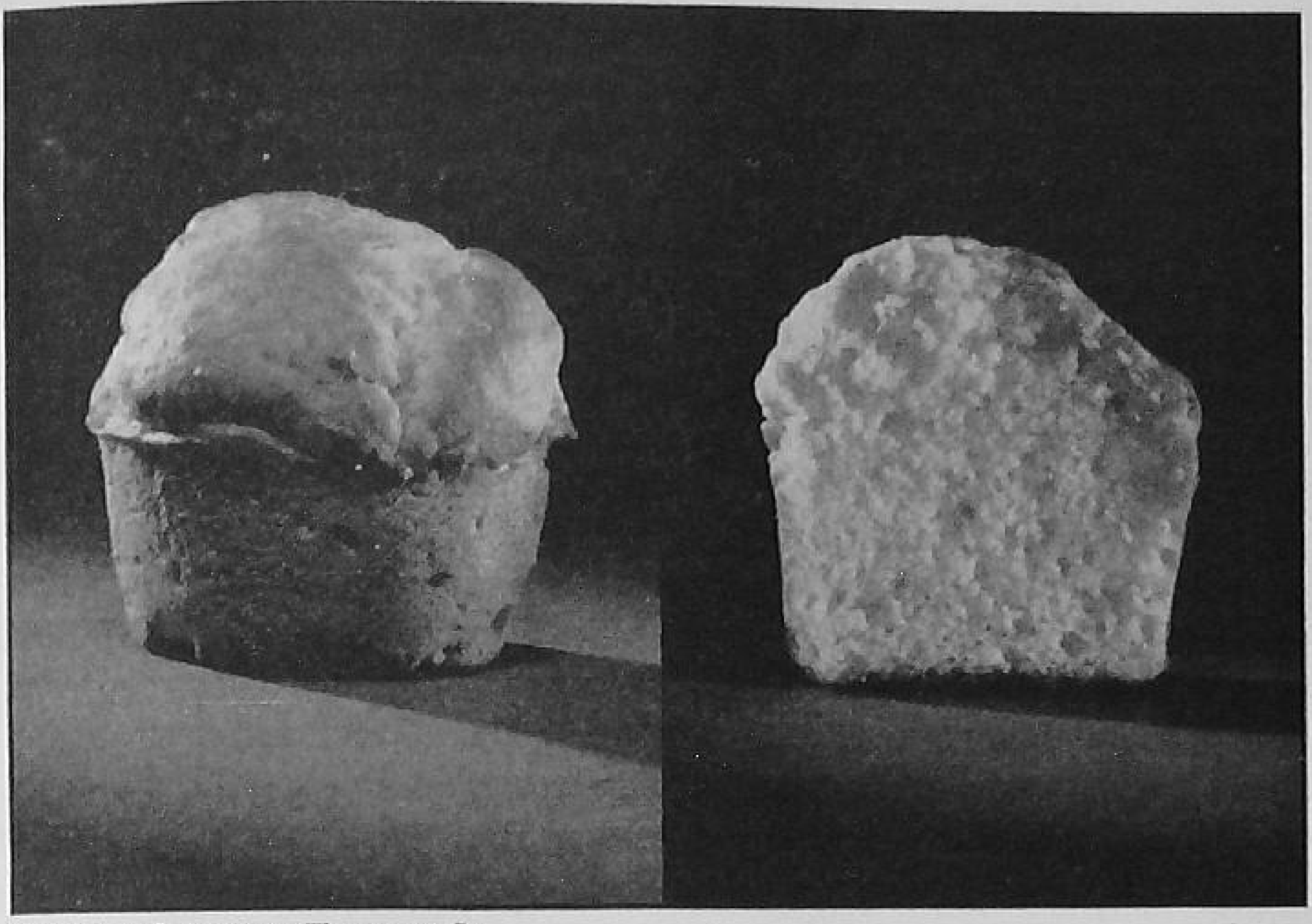
† When 2½ T. of 40 per cent cream are used it is approximately equivalent to 1 T. fat and 1½ T. milk. Five T. of 20 per cent cream is equivalent to 1 T. fat and 4 T. milk. When cream is the source of fat, reduce the milk equivalent to that added in the cream.

‡ Substitution of equal amounts of brown sugar, molasses, syrup, or honey for granulated sugar is satisfactory only when the proportion of granulated sugar in the original recipe is small.

those in which more sugar and fat are used, the effect of excess mixing is less apparent. The extra sugar and fat tend to prevent toughness. Although overmixed bread may be somewhat heavy, it is not so irregular in grain.

Biscuits are sometimes mixed by the muffin method, but more commonly by the biscuit method, which closely resembles the pastry method. The biscuit method of mixing is:

> Sift dry ingredients together into mixing bowl of suitable size. Add the cold fat and mix with the dry ingredients, using two knives, a fork, a pastry blender, or the fingers. When the mixture is the consistency of cornmeal, add the liquid all at once. Stir until the mixture stiffens, about 20 to 30 seconds. Turn onto a floured board, and knead lightly 20 to 30 seconds or until the dough is smooth and uniform.



Courtesy of Robertshaw Thermostat Co.

Fig. 77

Standard muffins have a slightly rounded pebbled top which is symmetrical.

Frequent observation of the quick breads indicates that waffles, griddle cakes, and muffins tend to be poor in quality when overmixed; whereas biscuits more commonly show the effect of insufficient mixing.

It is often advantageous to mix the ingredients in advance. In making griddle cakes and waffles it is almost impossible to cook all of the batter as soon as mixed. The batter is thin, so carbon dioxide escapes readily. For this reason it seems desirable to use a slow-acting baking powder and to stir the batter no more than is absolutely necessary even when dipping or pouring it onto the cooking utensil. Muffins may be made, put into pans, covered with a plate and then with a damp cloth, and set in the refrigerator for as long as 45 minutes before baking. Biscuits, when cut into shapes, placed on the baking sheet, and covered to prevent drying, are not injured by standing in a cold place for a short time before baking.

Cooking

The method of cooking also bears a relation to the character of the product. Examination of standard recipes for waffles and griddle cakes shows

them to be similar. If so wide a difference occurs in two products, both of which are cooked by hot metal, it is not surprising that products cooked in the oven differ even more widely from these.

Quick breads that are baked by radiated heat are exposed to heat on all surfaces; those cooked by conducted heat through the use of metals are often cooked first on one side and then on the other. The nature of the crust and the character of the texture are affected both by the temperature reached and the process by which the product is cooked.

For waffle irons and griddles heated over burners, there is no exact way to determine when just the right temperature for cooking the product is reached; however, practically all electric waffle irons and grills on the market today have automatic heat controls and indicators to show when the desired temperature has been reached. These tend to take the guesswork out of cooking waffles and griddle cakes. Regardless of type, irons should be hot but not smoking. Obtaining the correct temperature for baked products need not be a matter of guesswork. An oven thermometer may be used to indicate the temperature of ovens not automatically controlled. Oven regulators further facilitate control of the temperature in many ovens. Popovers are best baked in an oven of 219° C. (425° F.). Many recipes advise putting the batter into preheated pans, but experiments show that this is of little value in producing a product of higher quality. Popovers should be baked until they feel quite firm, as they tend to lose their crispness when taken from the oven. If they brown too much before becoming firm, the heat may be turned off and the baking finished in the cooling oven. Unless quite crisp they will seem soggy when cooled slightly. Muffins and biscuits, too, are best baked in a hot oven (219° C. or 425° F.). Correct temperature alone does not guarantee a well-cooked product; the length of time of baking is also a factor. Too short a cooking period gives a pale, perhaps only half-cooked product; too long cooking may result in too deep a brown color or even a burned product, and may also cause the crust to be both hard and thick. These products if baked at the proper temperature, and if not too large or thick, will be done when well browned.

Characteristics

Griddle cakes approach the standard when they are evenly browned on both sides, have fairly regular shape, are of a uniform thickness, have a smooth, tender crust, are light and tender, moderately moist, not sticky, and have an even grain and a pleasing flavor. Waffles should be a uniform golden brown with a regular shape. They should have a crisp, tender

Courtesy of Pillsbury Mills, Inc.

Fig. 78

Standard biscuits are symmetrical and have a fairly smooth level top. Dumplings are light and fluffy, and waffles are well shaped and evenly browned.

crust, they should be light, and should have a slightly moist, soft crumb and a pleasing flavor. Popovers of high quality are golden brown with irregular and peaked tops. The crust is crisp and tender. They are hollow shells with a few thin partitions and slightly moist interior. The flavor is mild and well blended. Muffins should be golden brown with a definitely rounded pebbled top which is symmetrical. The crust should be crisp and tender. A cross-section of the muffin should show a moist crumb, medium-fine, evenly distributed air spaces, and no long narrow tunnels. The muffin should be tender and should have a good flavor. The fineness of the grain is largely dependent upon the richness of the muffin. The richer muffin tends to be finer in grain than the plain. Biscuits should be golden brown with a fairly smooth, level top. They should be symmetrical in shape and uniform in size. The crust should be crisp and tender and free from any excess flour. The inside should be creamy white and free from spots. It should be slightly moist, tender, light, and flaky or capable of being pulled up into thin sheets. It should have a medium-fine grain and a pleasing flavor. The following table summarizes probable causes of deviations.

TABLE 50. PROBABLE CAUSES FOR DEVIATIONS FROM ACCEPTED STANDARDS FOR HOT BREADS

Product	Deviation	Cause
Griddle cakes	Tough	Too much mixing Insufficient leavening Too slow cooking Wrong proportion of ingredients
	Not thoroughly cooked	Batter too stiff Griddle too hot
	Unevenly browned	Griddle too hot Griddle of uneven heat
	Poor flavor	Ingredients with "off flavor"
	Heavy	Too much mixing Standing too long before cooked Insufficient leavening
	Pale color	Griddle not hot enough
	Too thick	Batter too stiff
	Too dark a brown	Overcooked
Waffles	Tough and wilted	Same as for griddle cakes
	Irregular in shape	Not enough batter in iron
	Run out of iron	Too much batter in iron
	Stick to iron	Batter not the correct consistency Iron not properly cared for

Product	Deviation	Cause
		Iron not proper temperature
		Lack of fat in batter
	Poor flavor	Same as for griddle cakes
	Heavy	Same as for griddle cakes
	Pale color	Same as for griddle cakes
	Too dark a brown	Same as for griddle cakes
Popovers	Tough	Not baked long enough
		Oven not hot enough
	Hard	Baked too long
		Oven temperature too high
		Oven temperature not reduced when sufficiently browned
	Fail to "pop"	Wrong proportion of ingredients
		Not mixed sufficiently
		Oven not hot enough
Muffins	Unevenly browned	Too hot an oven
		Oven does not heat uniformly
		Pans filled too full
		Wrong proportions
		Too much beating
	Peaks	Pans filled too full
		Heat uneven
		Too much stirring
		Insufficient leavening
		Too stiff a mixture
		Too hot an oven
	Tough	Wrong proportions
		Too much mixing
	Heavy and irregular in grain. Tunnels.	Insufficient leavening
		Too much mixing
	Smooth crust	Too much mixing
	Hard crust	Too long baking
		Too high a temperature
	Harsh, dry crumb	Too stiff a batter
		Overbaked
Biscuits	Tough	Lack of fat
		Too much mixing
	Pale crust	Too slow an oven
		Too stiff a dough
		Flour on surface
	Uneven shape	Carelessness in handling
		Uneven heat
	Uneven brown	Uneven shape
		Uneven heat

Product	Deviation	Cause
	Flat and heavy	Wrong proportion of ingredients Improper mixing
	Coarse, porous grain	Improper mixing
	Dry, harsh crumb	Same as for muffins
	Hard crust	Same as for muffins
	Crumbly and oily	Too high a proportion of fat

Service

Quick breads are best when first cooked, and provision should be made to serve them hot. Muffins and biscuits should be served on a warm plate protected either by a napkin or a hot roll cover. Griddle cakes and waffles are best served direct from the iron to the plate. Frequently griddle cakes and waffles are cooked at the table. This makes it possible to serve them as soon as they come off the iron.

ACTIVITIES

1. Make typical quick breads such as:
   - Biscuits
   - Griddle cakes
   - Muffins
   - Popovers
   - Waffles
2. Make quick breads, using variations of the standard recipe as suggested on pages 352–353.
3. Compare and score the products.
4. Estimate the cost per serving of the products. Compare with the cost per serving of yeast bread.

Refer to *Practical Cookery*, "Quick Breads," pp. 42–51; Heseltine and Dow, *The Basic Cook Book*, "Quick Breads," pp. 120–124.

PROBLEM 16 *How shall yeast breads be prepared?*

In many homes, yeast breads are almost the only form of bread served. In others yeast breads are served for dinner, and quick breads are usually served for breakfast and luncheon. The yeast breads vary widely, both in the doughs that form their basis and in the shape in which they are

baked. White bread, whole wheat bread, rye bread, health bread made of the entire wheat grain, as well as many kinds of rolls including pan rolls, Parker House rolls, clover leaf rolls, and a variety of sweet rolls, are component parts of the American diet.

Equipment, time, and preference affect one's choice of a yeast bread. Although in recent years there has been a marked increase in the use of bakery-made bread in preference to homemade bread, much bread is still made in the home. Moreover, studies indicate that the household production of bread has a sound economic basis. A real money saving may result, even when the homemaker's time is considered at a fair market price.

Homemade bread has a different flavor and texture from the commercially made product, and for this reason if for no other, a certain amount of bread is still made in the home. Especially is this true of rolls. Homemade rolls, well made, are truly delicious. However, many consumers prefer baker's bread. Included in the reasons for this preference are the general uniform quality of baker's bread which insures a standard product from day to day, and the uncertainty of most homemakers of success every time. The saving of time is another factor. Improved sanitary conditions in the bakeries are no doubt also in part responsible for the change. The reasonable cost of baker's bread brings it within the reach of many.

Regardless of the particular yeast bread to be made, certain steps are common to all, and certain precautions must be observed. The use of yeast as a leavening requires rather careful control of temperature during the rising period. A temperature of 27° C. (82° F.) is satisfactory for the growth of yeast in bread. A temperature greatly above that results in a product with a "yeasty" odor and flavor due to the development of foreign organisms. A temperature somewhat below the optimum retards the growth of the yeast so that a long time is required for the fermentation process and the rising of the bread.

Ingredients

The ingredients are important. Flour is the principal constituent, and as a rule, hard wheat flour is used because it is a strong flour which yields a dough containing sufficient gluten to permit the expansion caused by the formation of carbon dioxide. In a good bread flour the gluten, when well developed by thorough mixing, should be sufficiently elastic to expand to two or three times its original bulk and still hold the gas within the cells. The flour should also be suitable for the production of carbon dioxide. This is determined by the diastatic activity of the flour, which is dependent

upon the diastase present and upon the susceptibility of the starch to the action of this enzyme which hydrolizes starch.

The yeast used may be granular, compressed, or a starter. Granular yeast is more or less dormant, and should be mixed with water and some yeast food such as sugar and allowed to stand in a warm place for a short time before the dough is mixed. Compressed yeast acts quite rapidly when mixed into a dough. The starter, too, acts rapidly. The amount of yeast used varies widely, depending largely upon the time to be allowed for fermentation. A larger proportion of yeast shortens the fermentation period and, if conditions are favorable, does not give a yeasty flavor to the bread.

The liquid used may be milk, water, or water in which potatoes have been cooked. Bread made with milk has greater food value, and is believed to become stale less rapidly. Potato water seems to meet the need of the yeast particularly well, and the dough in which it is used rises rapidly; it is often, however, dark in color. The liquid should be scalded previous to using in order to destroy undesirable enzymes.

Sugar is added to the dough as a ready source of food for the yeast. A small amount of sugar is generally present in the flour, and more is formed by the action of diastase. However, this is not sufficient for the rapid development of the yeast. Besides acting as a food for the yeast, sugar adds flavor to the bread. It also caramelizes on the surface as the bread is baked and aids in browning.

Bread may or may not contain fat, but if it does, the fat should be in small quantities so as not to interfere greatly with the formation of gluten. Fat adds flavor to the bread, makes it more tender, and, perhaps most important, retards staling. Salt improves the flavor of the bread and aids in regulating the growth of microorganisms. In the right proportions, it controls the growth of the yeast at the desired level. Too much retards the development of the yeast and a long fermentation period is required.

Combining ingredients and kneading

Two methods of mixing are used, the straight dough method and the sponge method. When the straight dough method is used the flour is all added without a preliminary fermentation period. In the sponge method, only enough flour to make a drop batter is added at first. Then after a fermentation period the remainder of the flour is added, and the dough is kneaded.

The kneading or mixing of the dough is of great importance. When it is stiff enough to leave the sides of the bowl and cling to the spoon in one

ball, the dough is placed on a lightly floured board. It is then kneaded lightly but thoroughly until the gluten is well developed and the dough feels soft and pliable. This may not take more than five minutes for an experienced person. It is impossible to give a definite time for kneading, for the optimum will depend upon the experience of the person making the bread, the quantity being made, and especially upon the quality of the flour. Some flours require only a short kneading period; others a considerably longer one. Dough which has been kneaded sufficiently is satiny and smooth. At the beginning of the kneading period the dough should be so soft that it tends to cling to the board. With longer working, more water is imbibed and the dough stiffens. It is very easy to add too much flour.

It has been shown that thorough mixing is effective in producing a larger and better loaf, but that too much mixing is undesirable. There is a tendency to overmix when using a mechanical mixer, but little or no danger when kneading by hand. However, there is much greater danger of undermixing by hand.

Fermentation

When the kneading is completed, the dough is formed into a round ball with a smooth surface and is placed in a warm bowl or jar to rise. The surface of the ball of dough should be lightly greased to prevent drying and to permit ready expansion. The dough should be set in a warm place (27° C. or 82° F.) to rise. During the fermentation period a foam is formed of the carbon dioxide bubbles in the dough, accompanied by an increase in acidity. This is of value in hastening the breaking down of the starch to sugar; it also suppresses bacterial growth and favors the growth of yeast. Although the length of the fermentation period is dependent largely upon the amount of yeast added, it is affected by temperature and by the food supply. The first rising or fermentation period is the longest, and during this time the dough should double in bulk. The second rising, if used, is much shorter, and following this the dough is usually molded and placed in pans. If a very strong flour is being used, a third rising period may be desirable. During fermentation the character of the gluten is changed materially. If the dough is baked before fermentation has progressed far enough, the cell walls are thick, the bread is less tender, and the volume is smaller. On the other hand, too long a fermentation period results in too much stretching and softening of the gluten. Some of the cell walls collapse, the remaining cells are large, and their walls are thick. If fermentation has progressed much too far, the bread smells and tastes sour. It is then coarse, heavy, and compact.

Kneading or punching down

The dough is ready to be kneaded down when it is light or approximately doubled in bulk. A test is to press the dough lightly with a finger. If an impression which remains is readily made, the dough is ready to be kneaded down. This is accomplished by putting the hand in the center of the dough and then folding the edges of the dough to the center. The dough is then turned over to form a new ball and once more set in a warm place to rise. This kneading or punching after fermentation has several functions. Unlike the first kneading, its primary purpose is not to develop gluten. It provides, by further mixing, a more uniform distribution of the food and the yeast. It aids in equalizing the temperature throughout the dough. More oxygen is made available to the growing yeast plant. Excess gas is driven out, and overstretching of the gluten is thus prevented. The remaining gas is more evenly distributed, tending to make a more uniform grain.

Kneading or punching following fermentation should be light. If too vigorous, it tends to give a loaf with a coarse grain and thick cell walls. This is due to the squeezing together of the strands of gluten which have formed during the rising period. No flour should be added after the first mixing and kneading. Any added later tends to cause streaks in the bread.

Molding the loaf

When the dough is ready to be molded into loaves, it is cut into portions of the desired size, kneaded lightly, and allowed to stand for about fifteen minutes. Each portion is then placed on the board with that part down which was uppermost while rising. The dough is then flattened out, either with the hands or with a rolling pin, and shaped into a loaf. To shape it, fold two sides of the dough so that the dough is in the form of a triangle. Then starting with the apex of the triangle, the dough is rolled and shaped into a loaf. The edges are sealed by pressing them together so that a compact shape is obtained. Each loaf is put in a pan and again the dough is set in a warm place (27° C. or 82° F.) to rise until approximately doubled in bulk. Baking in an ungreased pan gives a somewhat greater volume. However, greasing the bottom of the pan facilitates removal of the loaf.

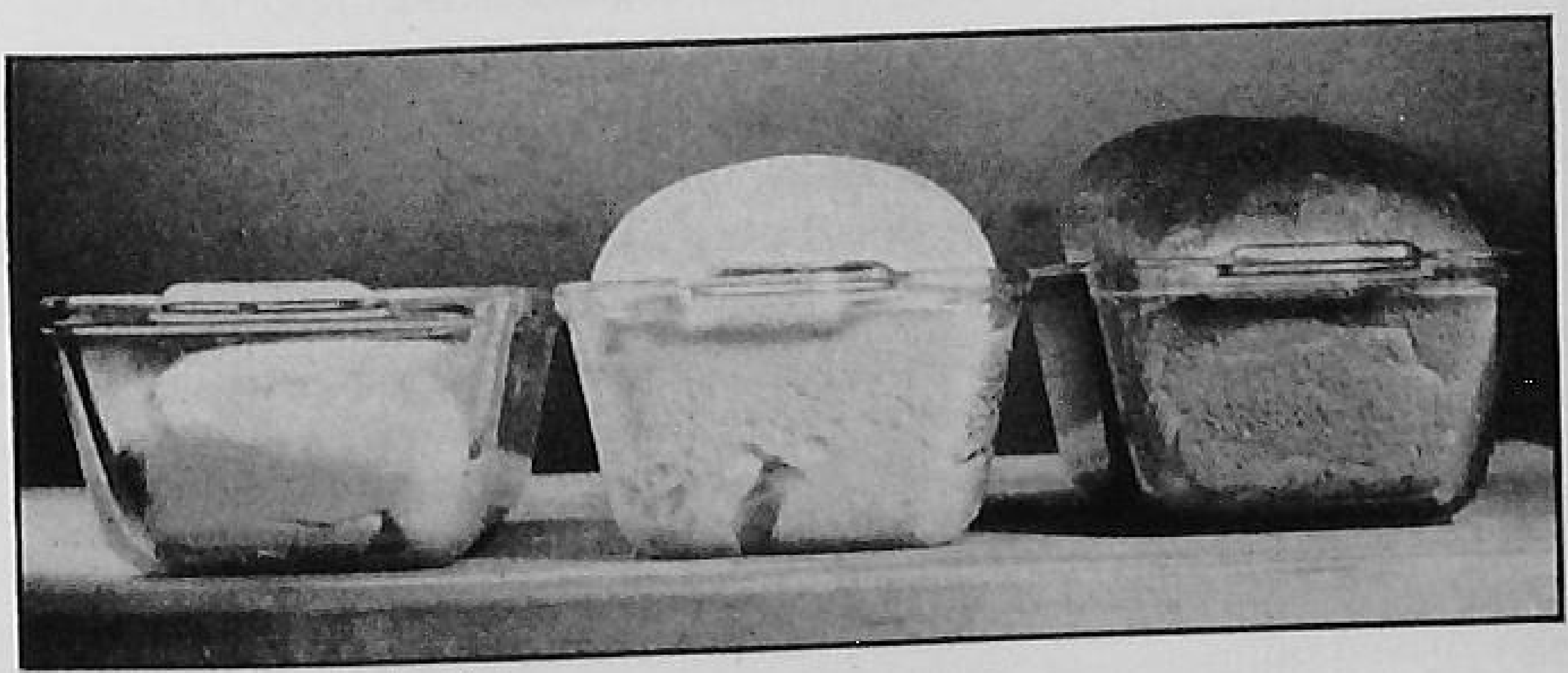
Baking

For baking yeast breads, a temperature of 204° to 220° C. (400° to 428° F.) for thirty-five to forty-five minutes is recommended for a pound loaf. A smaller loaf will require less time. A large loaf will require more time and probably a lower temperature. The exact temperature to use

also depends upon the richness of the loaf and upon the type of crust desired. Long baking makes a thicker crust. If it should be necessary to bake the bread before it has risen sufficiently, the temperature of the oven may be lowered for a brief period in order that the bread may rise even after it is put in the oven. During baking the protein coagulates, making the framework of the loaf. The starch is partially gelatinized, and the sugar on the surface is caramelized, giving the brown crust. When done, the bread is removed from the pans at once to prevent steaming and softening of the crust. The loaves should be cooled uncovered on a wire rack or across the top of the bread pans so that air reaches all sides. The tops may be brushed with fat if desired. Cold air should not blow on the loaves as this will cause the crust to crack.

Using soft wheat flour

Occasionally it is more convenient to use weak or soft wheat flour for bread. When this is done, certain precautions should be taken, because of the nature of the protein which yields a more dispersed gluten than that produced by hard wheat. Dough made with soft wheat flour should not be kneaded as much as one made with a stronger flour. A weak flour absorbs less moisture, so the amount of liquid is reduced. Better results are also obtained when the amount of yeast is increased, thus reducing the fermentation period. Usually the sugar is increased also. The loaf is molded after the first rising period. If allowed to treble in volume after it is panned, the bread may have a more desirable texture. With bread made from a weak flour, it is especially important that the pan be shallow if the loaf is to be large.



Courtesy of Wheat Flour Institute

Fig. 79

Three stages in the making of a loaf of bread.

Other factors affecting quality

Frequently a crust forms on the dough during fermentation because the surface has dried out. This often gives a streaked effect in the baked loaf. Crust formation may be prevented by covering the dough tightly and placing the container in a cabinet which will maintain the correct temperature and the desired high humidity. A light coating of fat on the surface is also effective. Such a crust formed on the bread after it is shaped into a loaf usually prevents proper browning, with the result that a pale, thick crust is formed by cooking.

The size and shape of the pan and the manner in which the bread is placed in it influence the quality of the loaf. If the pan is too deep, the loaf will be smaller than if the pan is shallow. A pan 7 by 3½ by 3½ inches has been found to be of good proportions and is large enough for the dough made with one cup of liquid. If the molded loaf is placed in the center of the pan it tends to rise more than if placed slightly to one side. If placed so that the folded side of the loaf is in the center bottom of the pan, the shape is retained better.

Staling

When cold, the bread should be stored in bread boxes or other containers which retard drying. The individual loaves may be wrapped in waxed paper or plastic film to aid in preserving quality. The prevention of staling or aging of bread, whether home- or bakery-made, is a problem. Temperature seems to be a big factor in staling. Below 60° C. (140° F.) the change is quite rapid until a temperature a few degrees below zero is reached. At −8° C. (18° F.), it has been found that staling is greatly retarded, and at −35° C. (−31° F.) bread will stay fresh approximately 70 days. Although some bread is preserved by freezing, cost of such storage will probably continue to limit the quantity so stored. The use of milk as the liquid and the addition of a small amount of fat both help to prevent staling. Commercially made bread may have a "bread softener" added which as the name indicates keeps the bread soft for considerable periods of time. If kept at a relatively high temperature, 60° C. (140° F.) or above, and if all loss of moisture is prevented, little or no staling occurs. However, these conditions are favorable for the growth of microorganisms; so this is hardly practical. Reheating the bread freshens it. This may be repeated several times if necessary as long as the moisture has not been driven off.

Characteristics

A loaf of bread of high quality is large for its weight. The top of the loaf

is well rounded and is free from cracks and bulges. The crust is an even, golden brown and is relatively thin. The grain is fine and even. The cells are slightly elongated in shape and the cell walls are thin. The crumb is smooth, soft, elastic, and creamy white, and it has a silken sheen in the light. The bread does not crumble enough to make cutting difficult. The flavor is sweet and nutty. The odor is pleasant and is neither sour nor "yeasty." The following table summarizes probable causes of deviations.

TABLE 51. PROBABLE CAUSES OF DEVIATIONS FROM THE STANDARD FOR YEAST BREAD

Deviation	Cause
Uneven shape	Improper molding Too much dough for pan Failure to turn loaf during first of baking Under-light when put in oven
Heavy	Low-grade flour Under-light or over-light when put in oven
Crackled crust	Too rapid cooling in a draft
Crust bulges and cracks	Too stiff dough Uneven heat in baking Under-light when put in oven
Thick crust	Too slow baking
Tough crust	Under-light when put in oven Too much salt Low-grade flour Too much handling of light dough
Pale crust	Too slow an oven Too much salt Drying of dough during rising Too little sugar
Dark crumb	Kind of liquid or flour used Unfavorable conditions, as over-light or under-light when put in oven, wrong temperature while rising, too cool an oven, or old or stale yeast
Streaked loaf	Poorly mixed Addition of flour at molding stage Drying of dough on top before shaping

Deviation	Cause
Crumbly loaf	Weak flour Wheat flour substitutes Over-light when put in oven Insufficient fermentation
Coarse-grained	Inferior yeast Low-grade flour Over-light when put in oven Wrong temperature and other unfavorable conditions
Sour taste	Poor yeast or flour Rising too long Too high a temperature while rising Too slow baking Incomplete baking

Rolls

The process of making rolls differs little from that of making bread. The chief difference is in the size of the roll as compared with that of the loaf. The structure or framework of the loaf of bread must be much stronger to support its weight; therefore the gluten in the dough must be strong and well developed. Since a roll is quite small, only a weak framework is necessary to support its weight, so the gluten need not be well developed. Therefore rolls may be beaten or kneaded only enough to give a uniform mixture. The dough is, as a rule, much softer than that for bread.

Many variations of rolls are made by adding various ingredients and by making into different shapes. Rolls are usually a little sweeter than bread and some are so sweet as to be almost cake-like.

Rolls bake quickly, in fifteen to twenty minutes, in a hot oven (219° C. or 425° F.).

ACTIVITIES

1. Make yeast bread.
2. Make rolls, selecting from among the following:
   - Braids
   - Cinnamon rolls
   - Clover leaf rolls
   - Hot cross buns
   - Parker House rolls
   - Refrigerator rolls
   - Salad rolls
   - Sticky pecan rolls

3. Use beaten yeast batter to make
   - Coffee Cake
   - Fruit puffs
   - Sugar and spice puffs
   - Doughnuts
4. Score the products. Compare the cost and quality of the products made in the laboratory with those made in a bakery.

Refer to *Practical Cookery*, "Yeast Breads," pp. 52–61; Heseltine and Dow, *The Basic Cook Book*, "Breads," pp. 105–137.

Recipes for products selected not found in these references are to be supplied by the instructor.

PROBLEM 17 *How shall sponge cakes be prepared?*

Sponge cakes or unshortened cakes are commonly divided into two classes, the white sponge or angel food and the yellow or true sponge. The former, as the name suggests, is white and contains the whites of eggs but no yolks. The latter contains both the whites and yolks. Within each class are certain variations. The white sponge cake may vary in the flavoring substances added, and the yellow may vary in the ratio of yolks to whites, and also in flavoring.

Sponge cakes are made without added fat. This has a definite effect upon the finished product and is probably partially responsible for the idea that sponge cakes are difficult to make. In almost every flour mixture fat is used to separate the particles of flour, preventing them from forming a tough, elastic mixture and increasing tenderness. In the white sponge cake there is no fat to aid in making it tender, and in the yellow, only that present in the egg yolks. Because sponge cakes are lacking in fat, their tenderness will depend upon the extent of whipping of the egg whites or whites and yolks, the mixing procedure, correct proportions, and proper baking.

True sponge cakes are made without the addition of soda or baking powder. Although steam supplies some leavening, air furnishes by far the greater portion. The incorporation of a large amount of air into the mixture in fine bubbles evenly distributed is therefore a major mixing problem.

Ingredients

Cake flour gives a tenderer product than bread flour, and, as a rule, yields a cake larger in volume and lighter in color. Finely granulated sugar is desirable because it dissolves more readily, gives a fine grain, and a soft rather than a crisp crust. If the sugar is coarse, a syrup may be made of sugar and water which is then added to the beaten egg whites. Increasing the proportion of sugar over that given in the standard recipe gives a sweeter, more tender cake, but it also tends to produce a sugary crisp crust, and to increase the danger that the cake will fall. Eggs are really the foundation of the cake. The character of the egg whites and the conditions under which they are beaten, as well as the number used, affects the quality of the product (see page 215). Reports of studies in which thick and thin whites were compared do not agree entirely. This may be due to the difference in the way the two types of whites were obtained as well as to the type of beater used. In much of the work the whites of fresh eggs were the thick whites and those from eggs that had aged were the thin. In some studies, however, fresh whites were used and these were separated into the thick and thin fractions. In general, recent work in which power beaters were used showed the thick whites to give a more stable foam and to produce angel food cakes superior in volume and tenderness to those made with thin whites. However thin whites whip more quickly and may give a larger volume when a hand beater is used. Egg whites beaten at room temperature give an angel food with a larger volume and finer grain than do egg whites beaten at refrigerator temperature. Increasing the eggs over the amount usually given in recipes, if accompanied by an increase in cream of tartar, may give a cake of larger volume and increased tenderness. Sometimes water is added to the egg whites to obtain a more moist, tender cake. This is not generally recommended, however, for this tends to give a less stable foam. Some workers find that the water is evaporated in the baking process and others believe the best angel food cakes are made from whites with no water added. Water is added to many types of yellow sponge cakes to give a softer more tender cake. However, the addition of too much water makes a thin mixture which separates into layers while baking.

The addition of acid to egg white increases its stability. Cream of tartar is especially effective. It is added to angel foods primarily to prevent shrinkage during and immediately following baking, but it also acts as a bleaching agent. With all other conditions the same, cakes without cream of tartar are creamy in color, and those containing it are white. Experiments indicate that in the angel food, at least, this bleaching is due to

the effect of increased acidity on the flavones or yellow pigment of the flour. These tend to become white, it will be recalled, in an acid medium. The use of cream of tartar also results in a more tender cake since the acid affects the protein of egg and probably that of flour. The tartrate ion seems to be especially effective in this process. Lemon juice is commonly used instead of cream of tartar as a source of acid in the yellow sponge cake. It also acts as a flavoring. Vinegar or other acids may be used but the results are usually less pleasing, mainly because of flavor.

Combining ingredients

There are many methods of combining the ingredients of a sponge cake, each of which gives excellent results when properly used. However, a wrong method or lack of skill in combining the ingredients may result in a tough cake, a cake with coarse, uneven grain, or a heavy "sad" cake. The order followed varies, both with the cake and with the person making it. Even so, certain procedures are recommended. The sugar and flour are each sifted once, as opposed the five or six times formerly recommended. Sifting, after the first time, does not incorporate large amounts of air as was formerly believed. The egg whites are beaten stiff but not dry. The desired stiffness may be judged by the appearance, the rate of flow when the bowl is inverted, or by the height of the peaks and the way they bend over when the beater is lifted out of the bowl. Experience is needed to determine just when the whites have been beaten sufficiently. As a rule, less beating is done preliminary to adding the ingredients if the sugar is to be beaten into the whites. Overbeating results in a decrease in the volume of the cake. The sugar and flour should be thoroughly mixed with the eggs, otherwise the cake will be uneven in grain.

In mixing the flour with the eggs, a cutting and folding motion is used, the egg whip or spatula is cut down through the mixture, almost parallel to the side of the bowl. Then it is turned until almost parallel to the bottom and is brought across to the other side where a shift in position brings it parallel to the side and up. When above the surface of the mixture the whip or spatula is again turned so that it is parallel to the surface of the mixture and is brought across to the starting-point. During the operation, the whip or spatula almost circumscribes a circle. With the electric mixer, which is satisfactory for sponge cakes, the time required is about the same as for hand-mixing. For beating eggs, use the high speed of a regular household mixer, but overbeating should be avoided. For folding in flour or flour-sugar mixture, the low speed should be used.

The following method yields an angel food of high quality:

Sift sugar once; add one third of sugar to the flour and sift three times. Beat egg whites with a rotary egg beater until foamy, add salt and cream of tartar, and continue beating until eggs are just stiff enough to hold their shape.

Add remaining two thirds of sugar to the egg whites, beating in gradually with the egg beater. After sugar is thoroughly mixed, add the vanilla, and continue beating for two minutes. With a large spatula or a whip egg beater, fold in the flour and sugar that has been sifted with it. Fold lightly for two minutes after the flour mixture has been added. Pour batter into an ungreased angel food pan, turning the pan as the mixture is put in. Then give the pan several taps on the table to free the batter from large air bubbles.

Sprinkling or sifting a thin layer of sugar or flour, whichever is being added, upon the beaten egg whites results in easier mixing of these and in less breaking down of air cells and consequent loss of leavening. The egg whites are somewhat stiffer after the sugar is added than before, and the resulting mixture is stiff, shiny, white, and of very fine grain. There is no evidence of large air bubbles. Mixing some sugar with the flour makes it possible to fold in the flour with greater ease. The folding of the mixture after the last of the flour is added breaks down any large air bubbles that may have been folded in and completes the mixing in of the flour. However, this folding must be done carefully, or air cells will be broken down, air will be lost, gluten will be developed, and the cake will be heavy, tough, and often coarse.

The exact method of mixing a yellow sponge cake depends upon the ingredients and upon the person making the cake. Four methods are rather widely used. (1) the sugar may be added to the beaten whites, making a meringue-like mixture, the yolks added and the flour folded in. (2) The whites and yolks may be beaten separately then combined, the sugar added and finally the flour folded in. (3) The sugar may be beaten into the yolks, the beaten whites added and the flour folded in. (4) One half of the sugar may be added to the beaten eggs and the remainder sifted and added with the flour.

Probably one of the most common faults in making yellow sponge cakes by method (3), is insufficient beating of the yolks and sugar. These combined with the liquid, will give a light foamy mixture when properly beaten. Underbeating may result in separation of a solid layer in the bottom of the cake during baking. Regardless of the exact procedure suggested in the recipe used, the same care is required in combining the ingredients as in making an angel food if the cake is to be light, fine-grained, and tender.

Baking

The sponge cake is often baked in a tube pan. The pan should be of such a size that it is about three fourths full when the batter is poured into it. It is most satisfactory to have a pan that is used exclusively for this purpose. The pan is not oiled, as it is desirable to have the cake stick to the pan until cold so that it will not have to support its own weight. If removed from the pan when hot, it is so delicate that it may collapse. A temperature of 180° C. (375° F.) to 205° C. (400° F.) gives a tender, moist cake of good volume, although some directions still suggest a lower temperature. Cakes started in a preheated oven are thought to be slightly better than those started in a cold oven. The tendency is to overbake the sponge cake. It is more tender if baked only until it just shrinks slightly, is a delicate brown, and the surface springs back when pressed lightly with the finger. Longer baking toughens it greatly.

Characteristics

A good product is symmetrical in shape, evenly and slightly rounded, and delicately browned. The crust is tender but not sticky. The texture is silky, tender, moist, and resilient. The grain is fine and uniform. A cake containing only the whites of eggs should be white, whereas, a cake containing both yolks and whites should be yellow, the depth of the color being influenced by the color of the yolks and their relation to the other ingredients. Such ingredients as chocolate also influence color. The odor and flavor, which should be delicate and inviting, are affected by the flavoring and the other ingredients.

Service

Sponge cake may be served in a variety of ways. A good sponge cake is so delicate in texture that covering it with a thick layer of rich frosting is incongruous. Many prefer to use no frosting, not even a light covering to enhance its appearance. In addition to being served as an accompaniment to fruits and frozen or other forms of desserts, sponge cakes are also used as a basis for desserts. A slice of sponge cake may be covered with crushed fruit, such as strawberries, and garnished with whipped cream; it may be served with chocolate, lemon, butterscotch, or other sauce. Two thin slices may be used as the basis for a sweet sandwich, filled with ice cream, whipped cream and nuts, or whipped cream and a combination of fruits. It often is used as a part of ice box or refrigerator puddings. The following table explains common deviations from the standard sponge cake.

TABLE 52. PROBABLE CAUSES FOR DEVIATIONS FROM THE STANDARD SPONGE CAKE *

Deviation	Cause
Thick, hard crust	Too hot an oven at first Too long baking
Sticky crust	Too much sugar Damp flour Insufficient baking
Tough crumb	Too high a baking temperature Too much mixing
Coarse crumb	Underbeaten eggs Too little mixing Too hot an oven
Dark color	Inferior flour Wrong proportions
Dryness	Overbeaten egg whites Too much flour Too little sugar Overbaked Too slow a baking temperature
Heaviness	Loss of air in mixing Omitting cream of tartar
Shrinkage	Too low a baking temperature Too little cream of tartar Insufficient baking

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ACTIVITIES

1. Prepare angel food cake.
2. Prepare yellow or true sponge cake.
3. Prepare a sunshine cake.
4. Prepare yellow angel food or egg yolk sponge cake.
5. Score the finished products.

Refer to *Practical Cookery*, "Sponge Cakes," pp. 190–192; Heseltine and Dow, *The Basic Cook Book*, "Sponge and Angel Cakes," pp. 495–499.

PROBLEM 18 *How shall cakes containing fat be prepared?*

Cakes containing fat or shortened cakes differ from sponge cakes or unshortened cakes in ingredients and in method of mixing. Cakes containing fat are usually made with a solid fat, although certain methods of combining the ingredients are designed for use with oils. As a rule, these cakes contain baking powder or soda, which true sponge cakes do not. These, perhaps, are the outstanding differences between the two types.

Shortened cakes may be plain or rich, according to the proportion of fat to other ingredients. A plain cake is low in fat and assumes many of the characteristics of muffins. A product of high quality is difficult to make. The richer cake has better keeping qualities than the plain. It becomes stale more slowly and is good even when not strictly fresh. The plain cake, on the other hand, is best when fresh. It is preferably served on the day it is baked, and frequently, while still warm. It may be accompanied by a sweet sauce such as chocolate, vanilla, or fruit.

The factors affecting the character of cakes are practically identical with those affecting the character of hot bread and other flour mixtures. For emphasis, these may be repeated: exact measurements, nature of ingredients, correct proportions of ingredients, proper method and temperature for the combining of ingredients, and right baking temperature. Cake flour, even and finely ground, is preferred, as a rule, for making cakes. When it is not available, all-purpose flour is used and the quantity is either reduced about one eighth or 2 tablespoons of cornstarch are substituted for 2 tablespoons of the flour in each cup.

Butter may still be the preferred fat because of its flavor, but it is now seldom used. Other fats with little or no flavor and with superior creaming qualities have largely replaced it. The addition of an emulsifier to many fats has improved their creaming qualities and hence the amount of air which is enclosed during the creaming process. This is important as the air thus enclosed acts as leavening. Neither a fat that has an exceedingly high melting point nor an oil is likely to be entirely satisfactory without some modification in the method of mixing. Finely granulated sugar is preferred. The liquid may be water, fruit juice, or milk, depending on the

type of cake. However, other factors remaining the same, water will give a more moist cake than an equal quantity of milk, which contains about 13 per cent solids. The eggs should be of high quality. Any type of baking powder may be used.

Combining the ingredients

The method of combining the ingredients of a cake largely determines its quality. In any method thorough blending, especially of the fat, is important. Many methods are now used for combining the ingredients. These vary in time required for mixing and in the quality of the cake produced.

The muffin method is the same as that given for muffins (see page 353). In making a plain cake, if a tartrate baking powder is used, the cake batter is stirred enough to prevent spattering and then is beaten for about forty seconds. Cakes made with phosphate or with S.A.S.-phosphate baking powder are beaten for one minute.

In using the cake mixer method, the ingredients may be added in any desired order. The fat may be softened and the eggs unbeaten. About the same amount of mixing is done as when the muffin method is used. The leavening agent may be withheld until the other ingredients are thoroughly combined, then added, and mixing continued for a minute or two. In a second cake mixer method the softened fat, sugar, and beaten egg are all put in a bowl and beaten until light and fluffy. If an electric mixer is not being used, a rotary egg beater may be used at least for the first of the mixing. The flour and milk may be added to the mixture all at once or alternately as in the conventional method. The second method will usually give a cake of higher quality than the first.

The conventional method of mixing requires more time than either of those already discussed. If this method is carefully followed the ingredients are well blended and the cake is of high quality. This method involves the use of a solid fat such as a hydrogenated fat, which is creamed until soft and plastic. The sugar is then added gradually with much creaming and mixing, until the mass is light, fluffy, and of about the consistency of whipped cream. This mixture is composed of fat, sugar, and air bubbles. The fluffiness of the mixture is largely determined by the amount of air incorporated, and this in turn is influenced by the nature of the fat and the temperature at which the creaming is done. For fats commonly used, a temperature from 20° to 28° C. (68° to 82° F.) is satisfactory. To the mixture of creamed fat and sugar, the beaten eggs or egg yolks, depending on whether the yolks and whites are beaten together or

separately, are added. Again the mixture is thoroughly blended, then a small amount, about one fifth, of the flour and baking powder sifted together is added and mixed thoroughly for about a half minute. The milk, containing the flavoring, is added alternately with the dry ingredients in about four portions. After each addition of milk, the mixture is stirred slightly. After each addition of flour it is mixed thoroughly but for no longer than about ten seconds. After the last of the milk, the remainder of the flour is added. After the last flour is added the mixture is beaten for about fifteen seconds if a tartrate powder is used, about thirty seconds if a calcium phosphate, and about one minute if an S.A.S.-phosphate is used. If the eggs are beaten separately, the stiffly beaten whites are folded or beaten in last. The egg whites should be thoroughly mixed in for about one half minute; otherwise the cake will be coarse grained, and the top may appear foamy.

Although exact methods for combining the dry ingredients and the milk with the fat-sugar-egg mixture are given, other methods may be used with equally good results. It is probable, however, that adding the milk and flour all at once is not as satisfactory as the suggested method.

Mixing by the method suggested, if properly done, requires from eighteen to twenty minutes. It gives a better cake, and many consider the additional expenditure of time worth while. This method, when not carefully used, gives a no more satisfactory cake than the quick methods, despite the longer time required.

For the "easy-mix" or "one bowl" method of mixing, all ingredients should be at room temperature. The flour, baking powder, salt, and sugar (also soda, cocoa, or spices) are sifted together into a mixing bowl. The fat, part or all of the milk, and the flavoring are added. These ingredients are then beaten vigorously with a spoon for two minutes or mixed with an electric mixer at a slow to medium speed for two minutes. The bowl is scraped frequently. Any remaining liquid and the unbeaten eggs, whites, or yolks are then added. The beating is continued two more minutes and the bowl is scraped frequently. This method gives best results with proportions of ingredients developed for its use.

The dough-batter or pastry-blend method of mixing usually gives a cake of slightly smaller volume but of uniformly fine grain. When this method is used the flour, baking powder (slow-acting), salt — and spices, soda, or cocoa when used — are sifted together. The fat is added and all are mixed five minutes (low speed if electric mixer is used), blending the flour and fat thoroughly. The sugar, mixed with one-half of the milk, is then added, and again the whole is mixed for five minutes. The unbeaten eggs,

flavoring, and remaining milk are combined and one half of this is added to the dough mixture. Mixing is continued one minute. The remaining liquid is added and the batter is mixed another two minutes or until it is smooth. The success of this method is apparently dependent upon thorough blending of the ingredients but not over-mixing. When an electric mixer is used for mixing cakes, any of the above methods may be used. Moderate or low speed will generally give best results. Care is necessary to prevent over-mixing.

A popular shortened cake made with oil has some of the characteristics of a sponge cake. It is made in a manner which resembles the muffin and cake mixer methods of mixing except that the stiffly beaten egg whites, to which cream of tartar has been added, are folded in last.

Baking

The pan in which a butter cake is baked may have a piece of oiled paper placed in the bottom, but it is generally well to leave the sides unoiled. This permits the cake to cling to the sides of the pan while baking. The temperature and the length of time for baking a butter cake depend on whether it is to be a loaf, layer, or cup cake, and on the proportion of ingredients used. Although the optimum baking temperature will depend on these different factors, the general statement is often made that a plain loaf cake is satisfactory when baked at 177° C. (350° F.) for about forty-five minutes, and a layer or cup cake when baked at 177° to 190° C. (350° to 375° F.) for twenty to thirty minutes. Too low a temperature results in small volume and poor texture. Cakes started in preheated ovens are, as a rule, superior to those started in cold ovens.

A cake is done when an inserted toothpick comes out clean, when the cake begins to shrink and leave the sides of the pan, and when, if pressed with the finger, it springs back to its original shape. Overbaking, especially of chocolate cakes, impairs the flavor.

It is considered well to allow a butter cake to cool slightly before removing it from the pan. The time required for cooling varies with the size of the cake but should probably be from five to fifteen minutes. When first removed from the oven, the cake is soft and fragile. When cold it becomes rigid and breaks readily and hence is difficult to handle.

Proportions

To obtain a cake of high quality it is necessary that a certain balance be maintained among the ingredients. Flour and egg form a framework which sugar and fat tend to weaken. A substantial increase in fat, sugar,

or both may be balanced by an increase in egg. A definite relationship must exist between the fat, sugar, liquid, and flour. "Allow ⅓ to ½ as much fat as sugar, equal amounts of sugar and liquid (including fat), and half as much liquid or sugar as flour," [1] are rules often given.

Before trying an untested recipe for a butter cake, it is well to apply these rules for proportions to the ingredients listed in the recipe. At the same time keep in mind that the proportions may vary considerably and a good cake still be obtained.

From one standard recipe, such as the one following, several variations may be made.

⅓ cup fat	1¾ cup cake flour
1 cup sugar	2½ teaspoons baking powder
2 eggs	¼ teaspoon salt
⅔ cup milk	1 teaspoon flavoring extract

However, many recipes for chocolate, white, and fruit cakes are quite different from the standard cake and its variations. The addition of other ingredients may modify slightly the method of mixing and may also affect somewhat the temperature of baking.

TABLE 53. VARIATIONS OF STANDARD CAKE *

STANDARD CAKE	Any one of the following modifications or additions may be made:
Basic recipe	Spice Cake: add ½ t. cinnamon, ¼ t. cloves, and ¼ t. nutmeg.
	Chocolate Cake: add 1–2 ounces melted chocolate. Decrease flour or increase liquid slightly as chocolate thickens mixture.
	Marble Cake: add ½–1 ounce melted chocolate to half of recipe. Add milk to thin as needed. Put mixtures into pan alternately to give a marbled effect.
	Nut Cake: add ½ c. chopped nuts.
	Common Fruit Cake: add ½ c. raisins or currants. Sliced citron, dates, or other fruits may be used.
	White Cake: use 3 egg whites instead of 2 whole eggs.

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[1] Department of Foods and Nutrition, Kansas State College, *Practical Cookery and the Etiquette and Service of the Table,* p. 183.

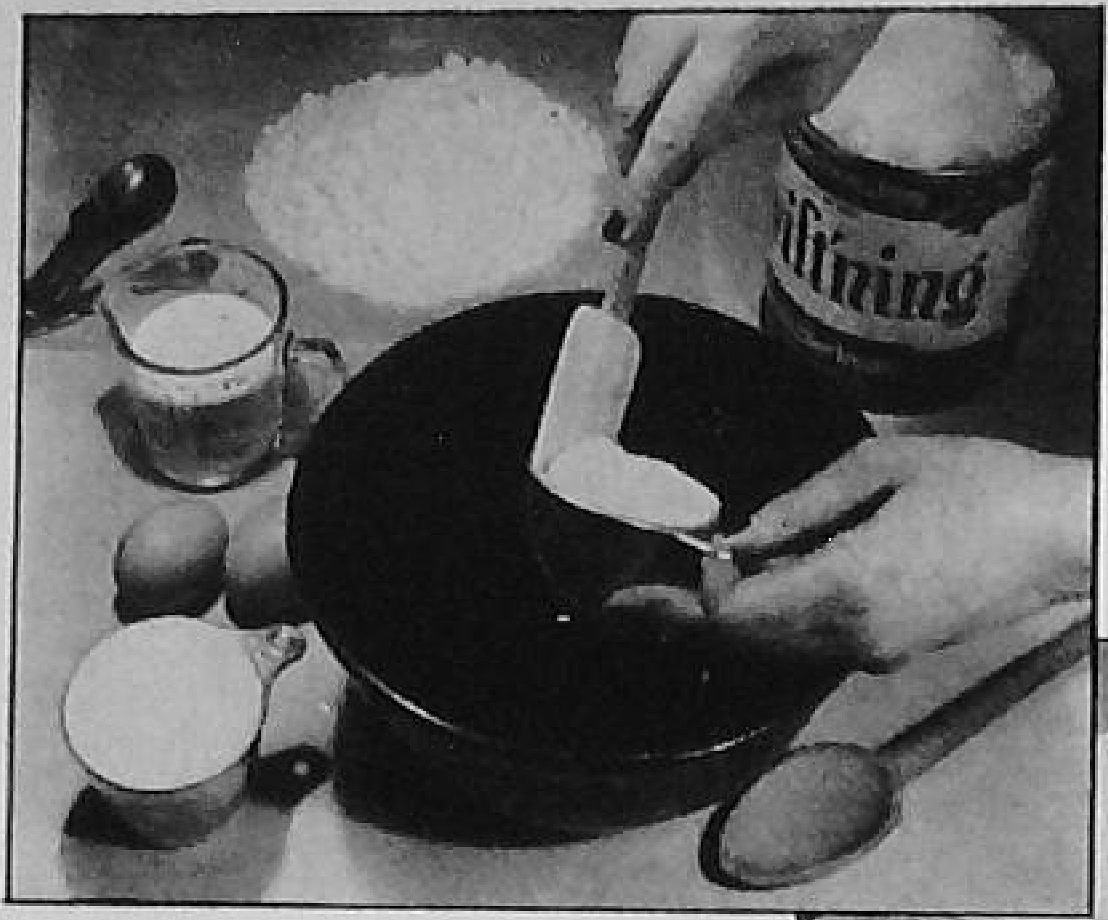
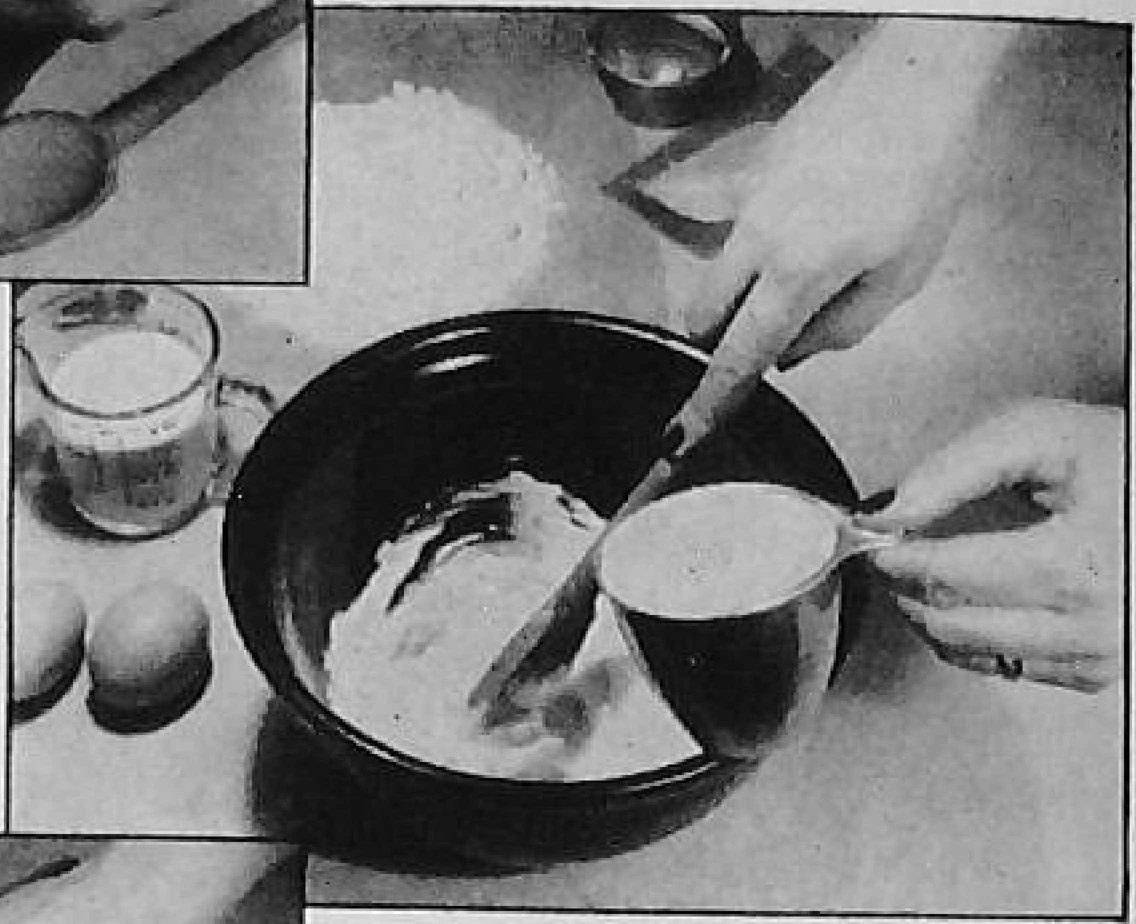


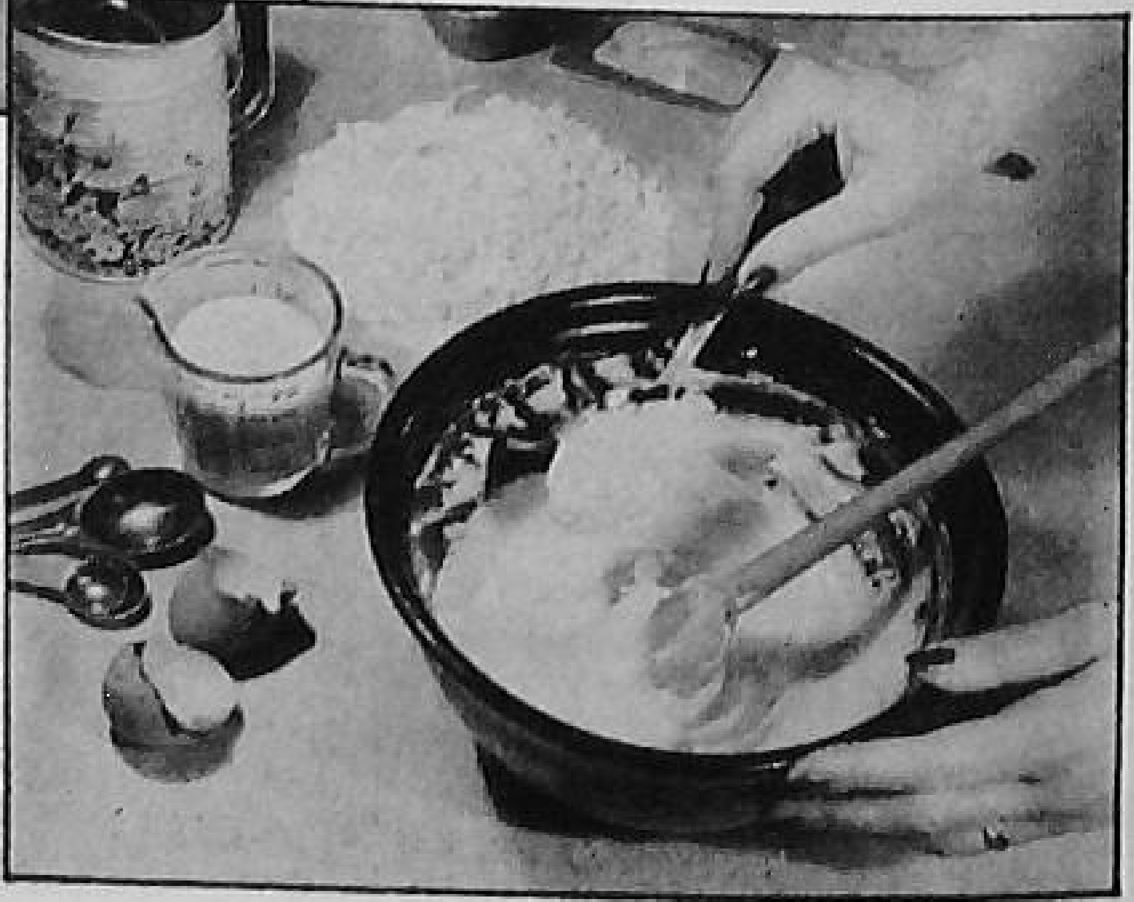
Fig. 80

Cake-making, creaming method: Measure ingredients. Stir fat to distribute around bowl.



Add sugar, salt and vanilla to fat. Beat until fluffy and smooth.

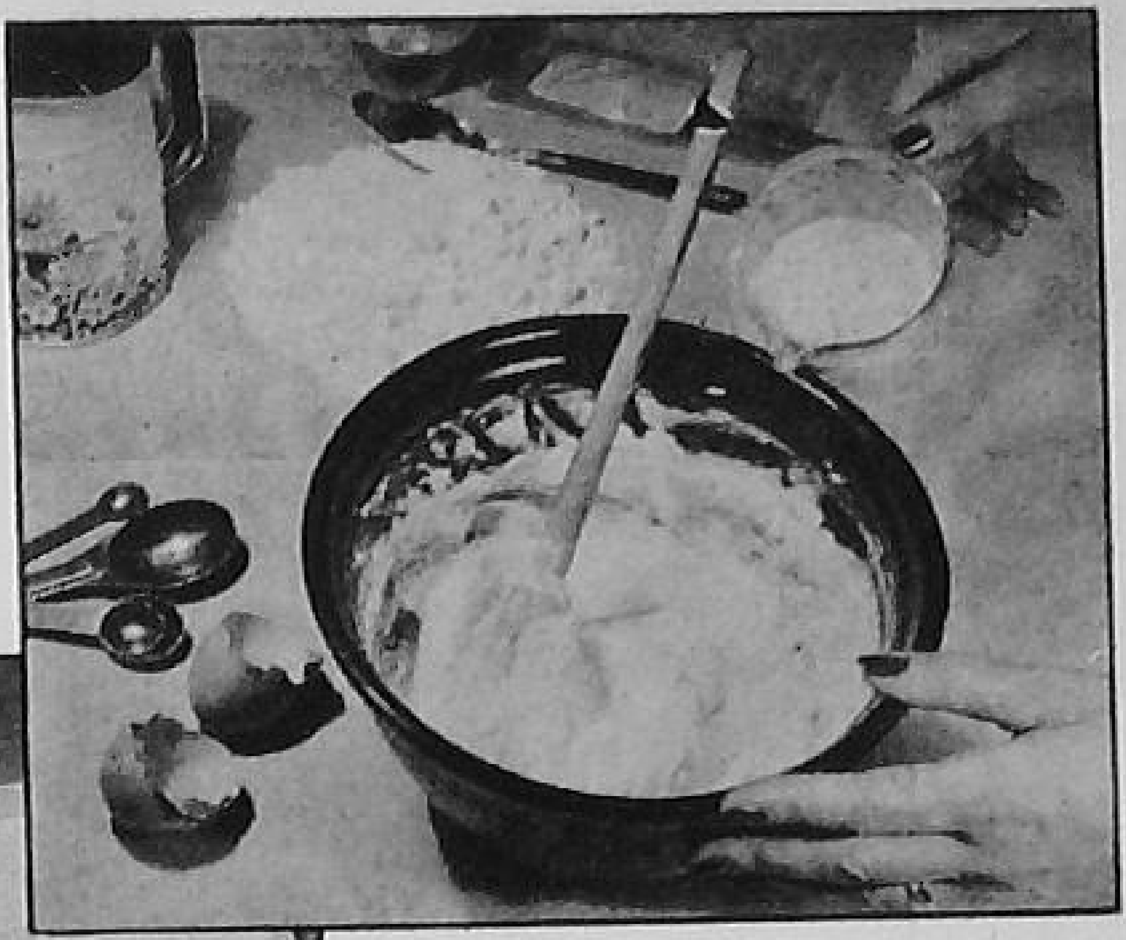
Add eggs, one at a time, beating well after each addition.

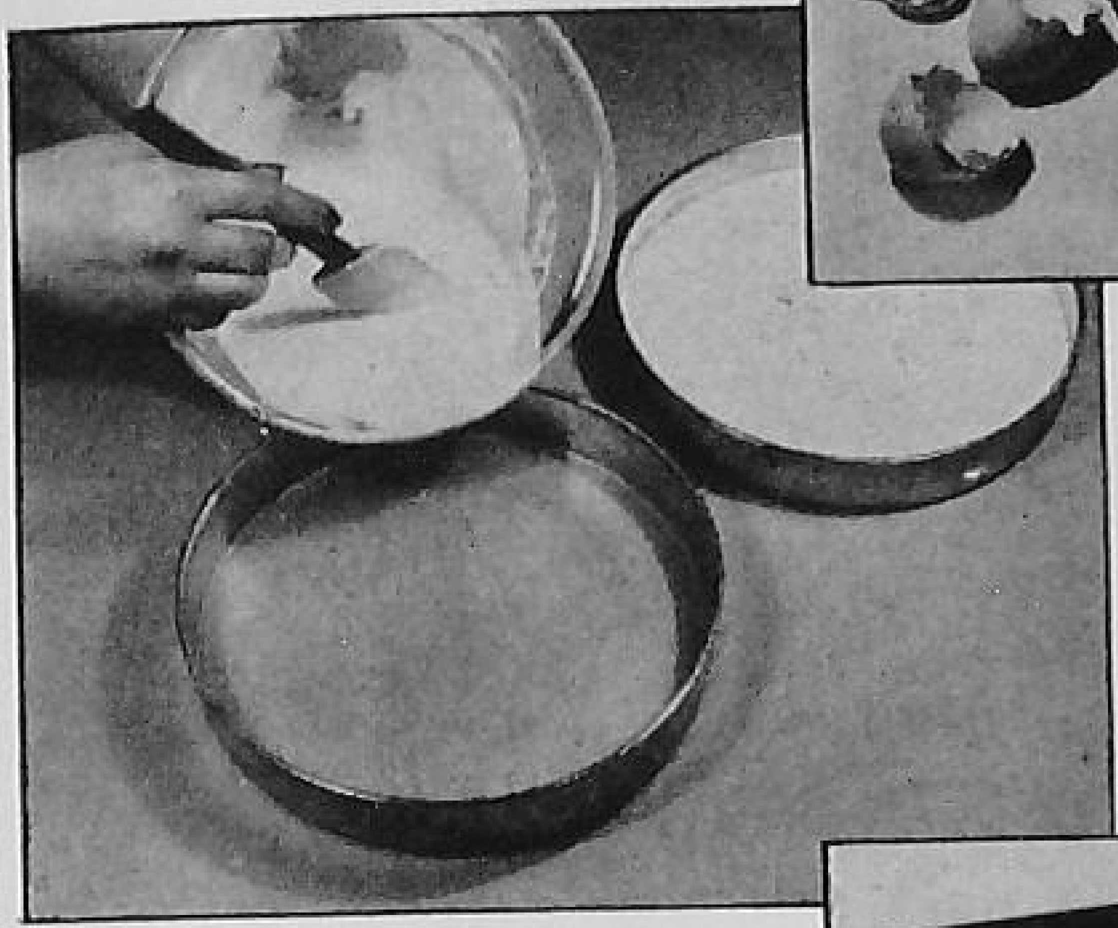


Sift together flour and baking powder onto waxed paper. Add a little at a time to fat-sugar-egg mixture and blend well. Small portions of flour blend in more smoothly than large portions.

Courtesy of Swift and Company

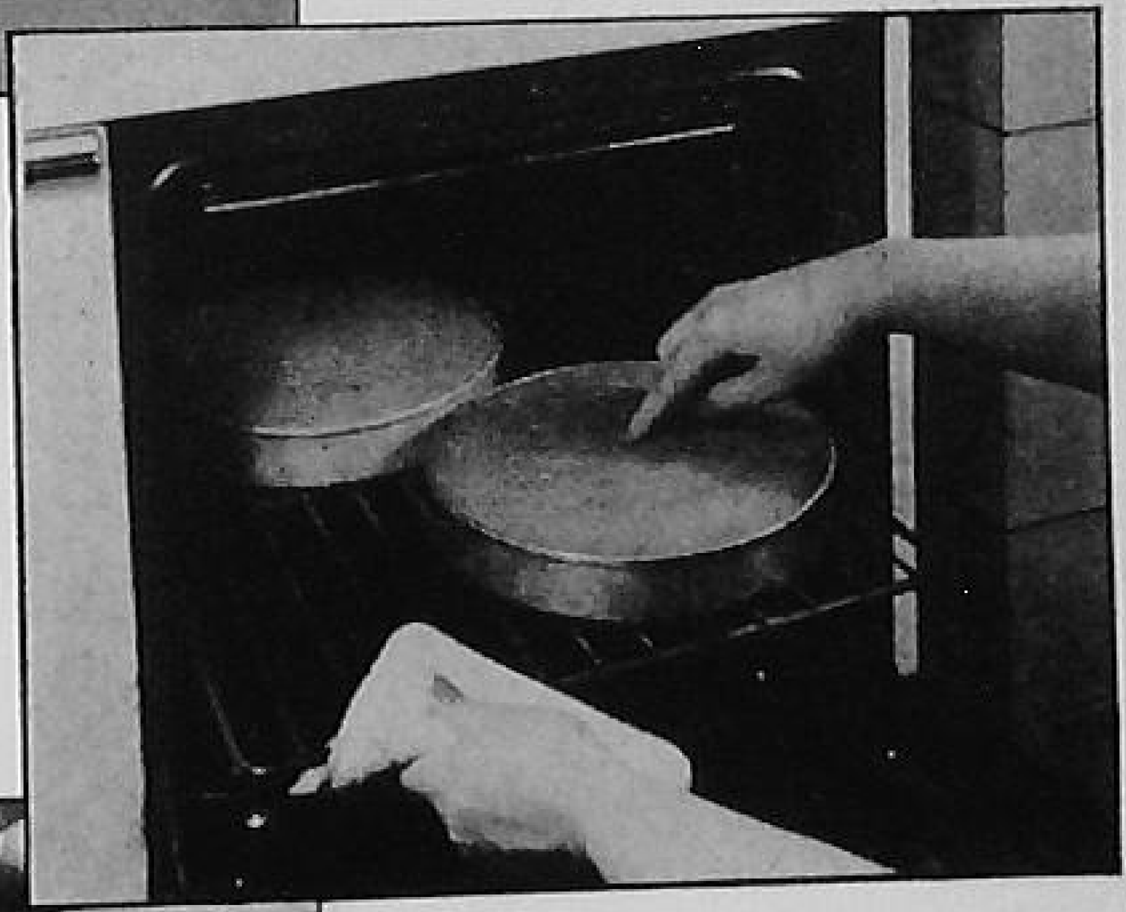
Pour in part of milk. Stir until batter is smooth. Continue to add flour and milk alternately, blending the mixture well after each addition. Be sure to add flour mixture last to blend ingredients into a smooth finished batter.

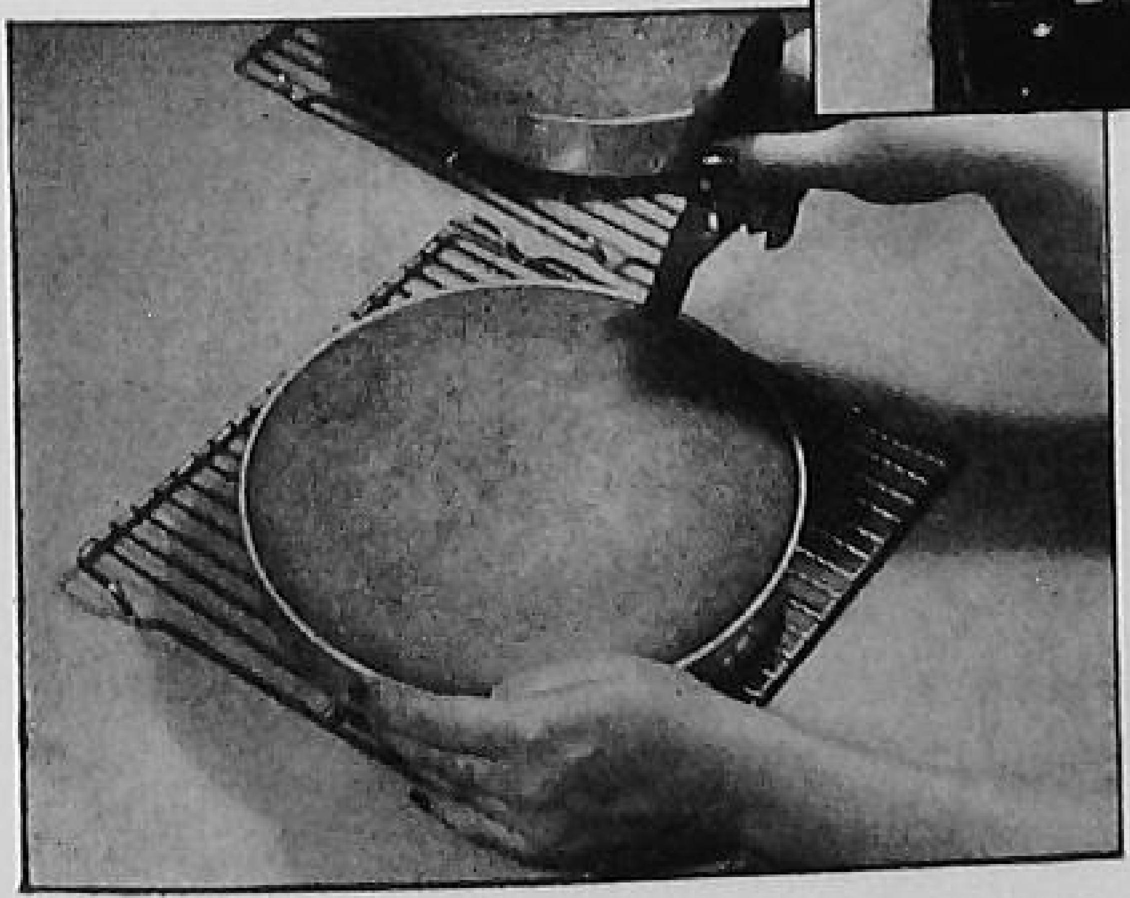




Pour equal amounts of batter into prepared cake pans.

Stagger pans on one rack near center of oven. Allow at least an inch of space between pans themselves and between pans and sides of oven. Cake is done when center of cake is touched lightly with fingertip and it springs back leaving no print of fingertip. It will shrink slightly from edges of cake pans when done.





Remove cakes from oven and place on racks to cool. Let them stand in cake pans from 10 to 15 minutes. Then loosen cake from sides of pan by running small spatula or a knife up and down around pan. Be sure cake is loosened completely. Place rack over cake pan. Invert. If necessary gently tap pan to loosen from cake.

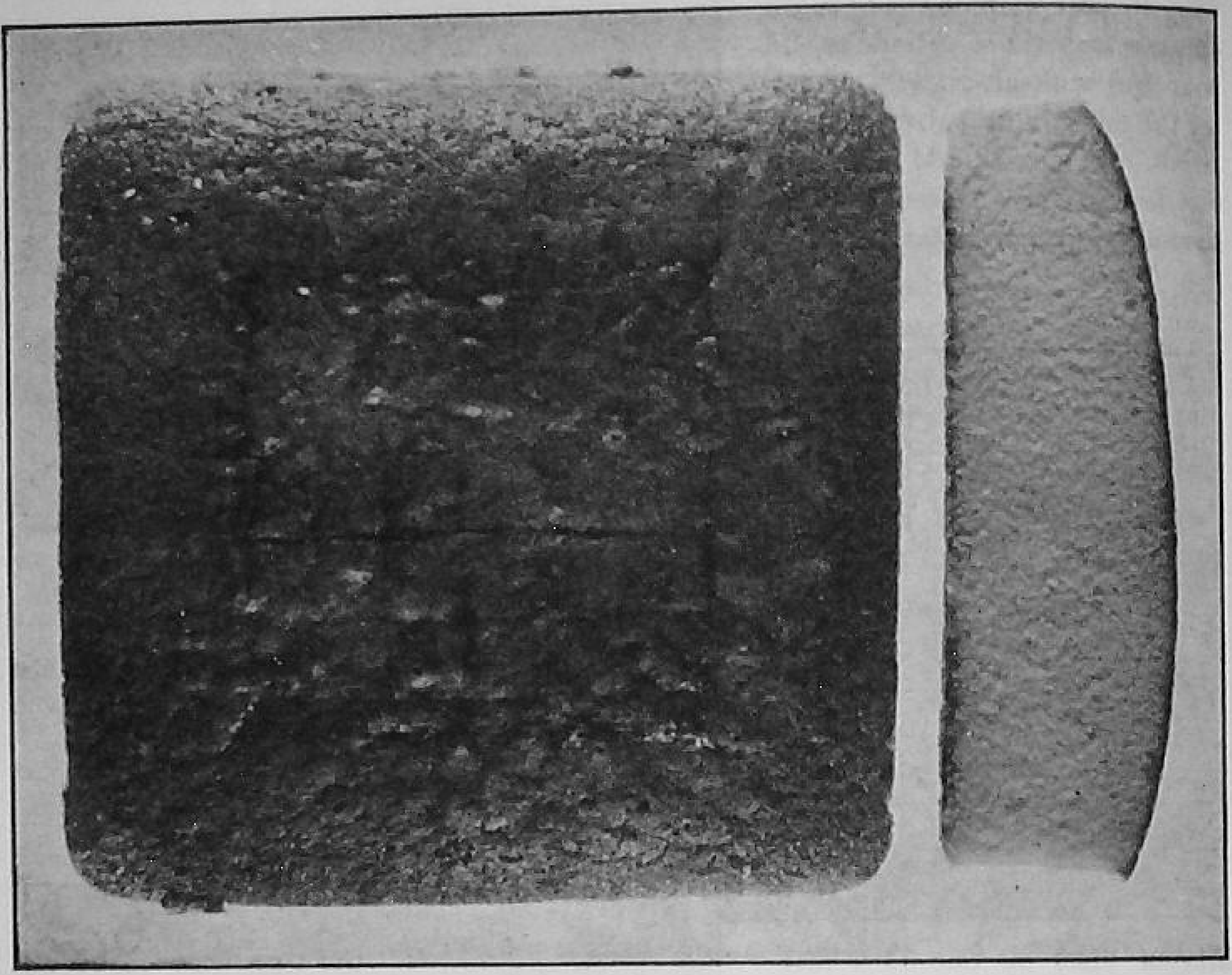


Fig. 81

A standard butter cake is slightly rounded and has a fine even grain.

Extra soda is often added to chocolate cakes to give a red color. This is usually accompanied by a soda flavor which may or may not be objectionable. Sometimes red vegetable coloring is added but this is not a recommended practice.

Many cookies are really variations of butter cakes. An increase in the proportion of flour or a decrease in the liquid called for in the cake recipe results in a stiff batter from which drop cookies may be made. A further increase of flour or lessening of liquid yields a soft dough suitable for rolled cookies. Cookies are baked in small units; so, as a rule, their baking time is short. The temperature for baking depends largely on the ingredients contained.

Characteristics

Some of the qualities of butter cakes are dependent upon the ingredients and their relation one to another. However, all good butter cakes have

certain characteristics in common. First, in external appearance the cake should be symmetrical in shape and only slightly rounded. If a layer cake, it should be almost flat on top. The crust should be soft and an even golden brown. It should have no appearance of "sugariness"; that is, it should be neither crisp nor shiny. The cake should have raised so that it is a good size in proportion to the ingredients used and feels light.

When cut, a good cake holds its shape and does not crumble excessively. The crumb is light and moist. The cake is tender, and the grain is fine and uniform. The color is in keeping with the ingredients used and shows no "off color" due to discoloration of the batter by the utensils. The odor and flavor are characteristic and pleasing. The following table explains common deviations from the standard butter cake.

TABLE 54. PROBABLE CAUSES OF DEVIATION FROM STANDARD CAKE

Deviation	Cause
Sugary crust	Too much sugar Improper method of mixing Too much leavening
Sticky crust	Too much sugar Damp flour Insufficient baking
Uneven browning	Uneven heat of oven Lack of leavening Insufficient mixing
Uneven shape	Uneven heat of oven Uneven oven, cake not level, pan warped
Falls, hollow in center	Too thin a batter Too stiff a batter Too much sugar Too much fat Too slow an oven Too much leavening Insufficient baking Too much batter in pan Too hot an oven
Coarse	Ingredients not properly combined Insufficient mixing Too much sugar

Deviation	Cause
	Too much leavening
	Incorrect oven temperature
Crumbly	Too much sugar
	Too much leavening
	Too low an oven temperature
Heavy	Too much mixing
	Lack of leavening
	Too much fat
	Too much sugar
	Too much liquid
	Insufficient baking
	Incorrect temperature for baking
	Incorrect cooling
Peaked	Too much mixing
	Lack of leavening
	Too hot an oven at first of baking period
	Too much flour
Tunnels and large holes	Too much mixing
	Uneven distribution of leavening agent
	Failure to expel air from batter when put in pan
Tough	Too much mixing
	Lack of shortening
	Lack of leavening
	Lack of sugar
	Too much flour
Poor flavor	Ingredients of poor quality
	Too much baking powder
Cracks on top	Too hot an oven at first of baking
	Too stiff a batter
	Width of pan out of proportion to depth and length
Sogginess	Steaming during cooling
	Wrong proportion of liquid to flour
Dry	Not enough fat
	Not enough liquid
	Egg whites beaten too much
	Overbaked
	Addition of chocolate with no increase in liquid or decrease in flour

	Too much beating (electric beater) Too much baking powder Not enough sugar
Grayish color in a white cake	Too slow an oven temperature Low-grade flour Use of metal spoon or bowl for mixing

ACTIVITIES

1. Prepare standard butter cake or a variation as given on page 381 of the text.
2. Score the finished product.

Refer to *Practical Cookery*, "Cakes," pp. 182–189; Heseltine and Dow, *The Basic Cook Book*, "Cakes," pp. 482–499.

PROBLEM 19 *How shall plain pastry be prepared?*

Pastry in the broadest sense includes a variety of baked products — pies, tarts, cream puffs, and even meringues, kisses, and some kinds of tea cakes. But by common consent, plain pastry is limited to pie crust.

Ingredients

Few ingredients are used in plain pastry. Flour and fat are the two that may vary in character. Pastry flour gives a tender crust that crumbles readily, but is less flaky. General purpose flour and bread flour give progressively more flaky crusts that brown readily, and unless increased amounts of fat are used, tend to give a tougher crust. Pastry made with these flours is much easier to handle than that made with pastry flour. Butter, as compared with lard and the hydrogenated fats, makes a browner crust, one that is flaky but which in most instances is less tender. Melted fats and oil give a tender crust but one which tends to be crumbly rather than flaky. Salt is added for flavor. The water added to form the dough may be either cold or hot. Baking powder is sometimes added to pastry, although its actual value is questionable.

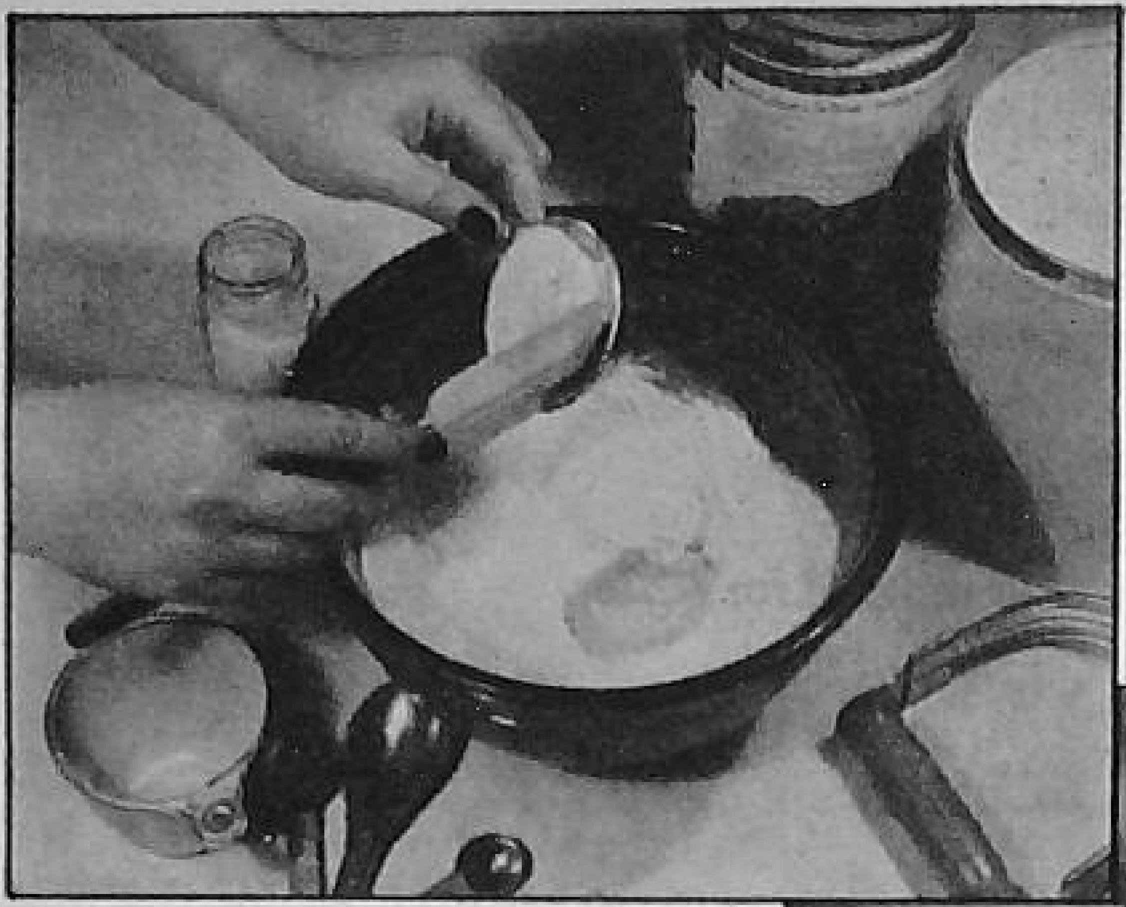
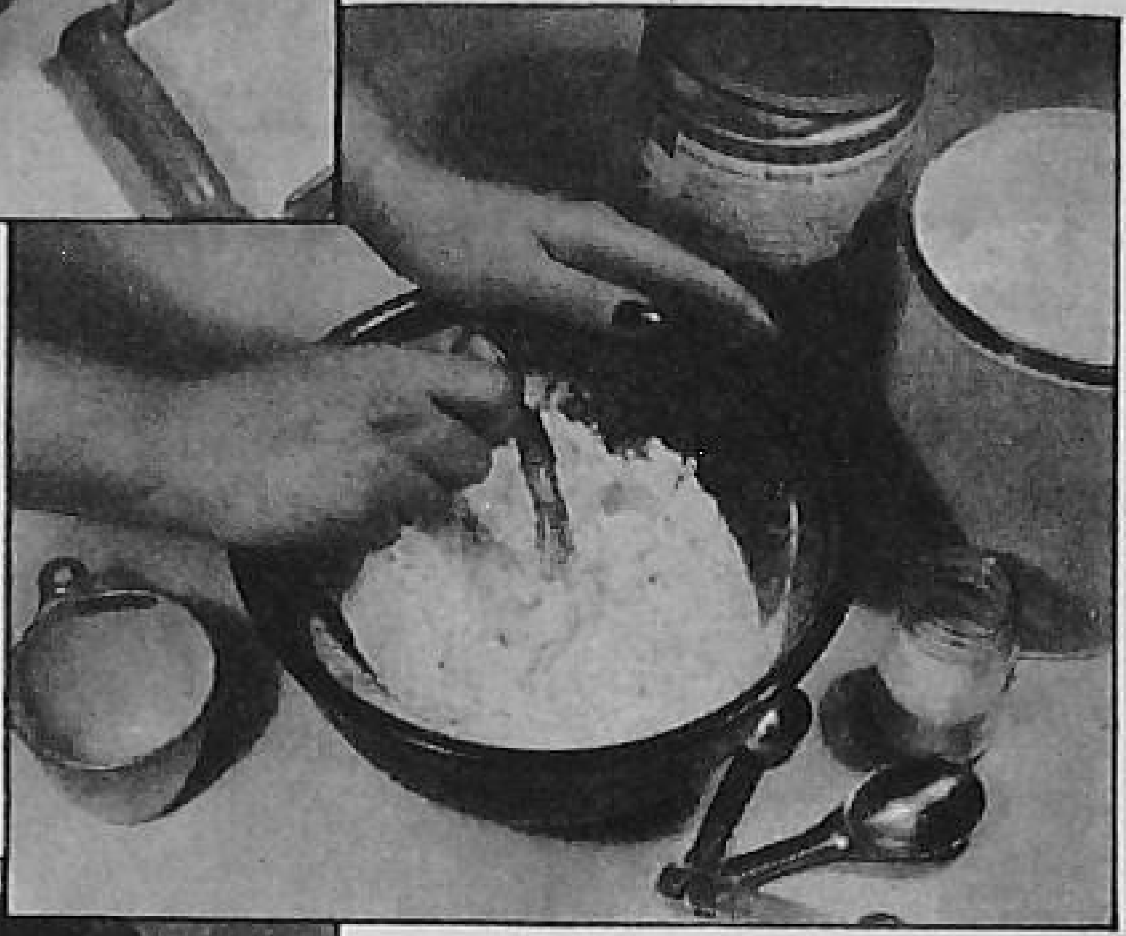


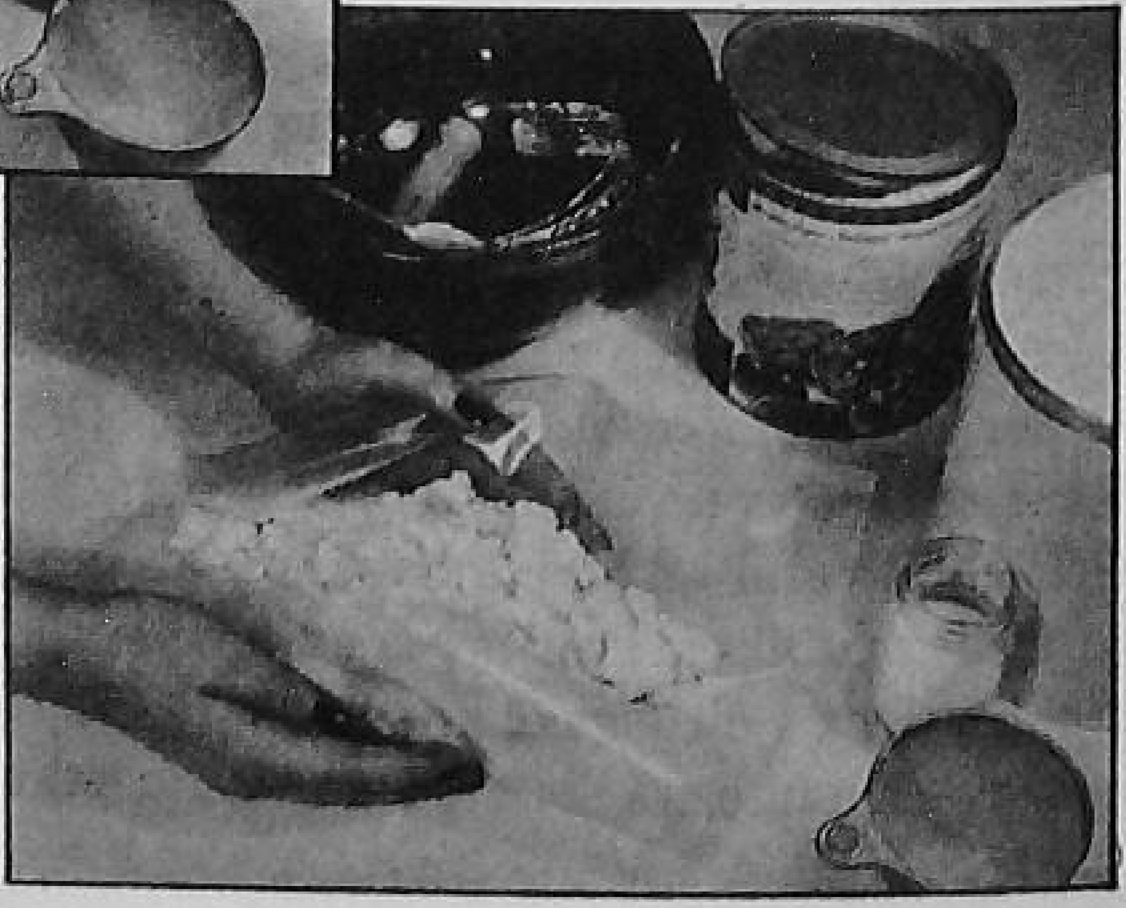
Fig. 82

Pastry dough: Measure sifted all-purpose flour, fat and salt into mixing bowl.



Cut fat into flour with a pastry blender, fork or two knives until mixture is consistency of cornmeal and small peas.

Sprinkle water over fat-flour mixture, a little at a time. Toss and mix lightly with spatula or fork. Don't mash. Push wet flour to one side. Sprinkle more water over remaining mixture. Repeat until mixture is moistened, Use *minimum* amount of water.



Turn dough onto piece of waxed paper. With hands under paper push and press dough together lightly. Don't squeeze, but work dough into ball inside paper. Open up paper and knead dough 2 or 3 times with palm of hand. Let dough rest for 15 or 20 minutes and it will roll out easily.

Courtesy of Swift and Company

Approved methods

Success in making a tender pie crust depends upon separation of the particles of flour from each other by means of fat to prevent the development of the gluten. The problem then is not only to get these particles separated but also to keep them separated.

Pie crust may be made with either solid or liquid fats. Correct use of the former gives a tender flaky crust; the latter gives a somewhat crumbly product. Both are quite satisfactory. The method used with solid fats is often referred to as the cold water method. In using this method the fat is usually cut into the dry ingredients with two knives or a pastry cutter until the particles are about the size of peas. As the object is to coat each particle of fat with flour, not to mix them thoroughly, it is important to work rapidly, keeping the mixture cold. If the fat and flour are thoroughly mixed, the flour is coated with fat so that it cannot take up sufficient water to form a dough. The mixture will then remain crumbly and will be difficult or even impossible to handle. The manner in which the water is added is important. Too much in one place gives a soft dough that will require excessive mixing, so it is best to add it a few drops at a time to an undampened surface. As it becomes moist enough to form lumps, these are pushed aside to give a new area. When the mixture will stick together with gentle pressure and may be somewhat flattened without the edges breaking, enough water has been added.

When a soft or liquid fat is used the method is often referred to as the hot water method. If an oil is used, this is really a misnomer as cold water is mixed with the oil. This method requires quite different manipulation. The water is added to the fat. The mixture should be soft but not exceedingly thin. It is then beaten until thick and creamy. A rotary egg beater is satisfactory to use. It may be necessary to chill the fat slightly to bring it a little nearer the solidifying point. The dry ingredients are then added, and the whole is mixed just enough to combine.

Regardless of the method used, pastry should be mixed as little as possible. When each particle of flour is moistened, the dough should be pressed together lightly and should be put in a cold place or put on a lightly floured board and rolled to the desired shape and size. Only enough for one crust should be rolled at one time. The recommended method of using the rolling pin is this: start from the center of the dough each time and roll in the direction that will give the desired shape. In order to keep the dough at an even thickness, the pin should never be rolled off the dough onto the board. The rolling pin should be lifted at the end of each stroke and started over again.

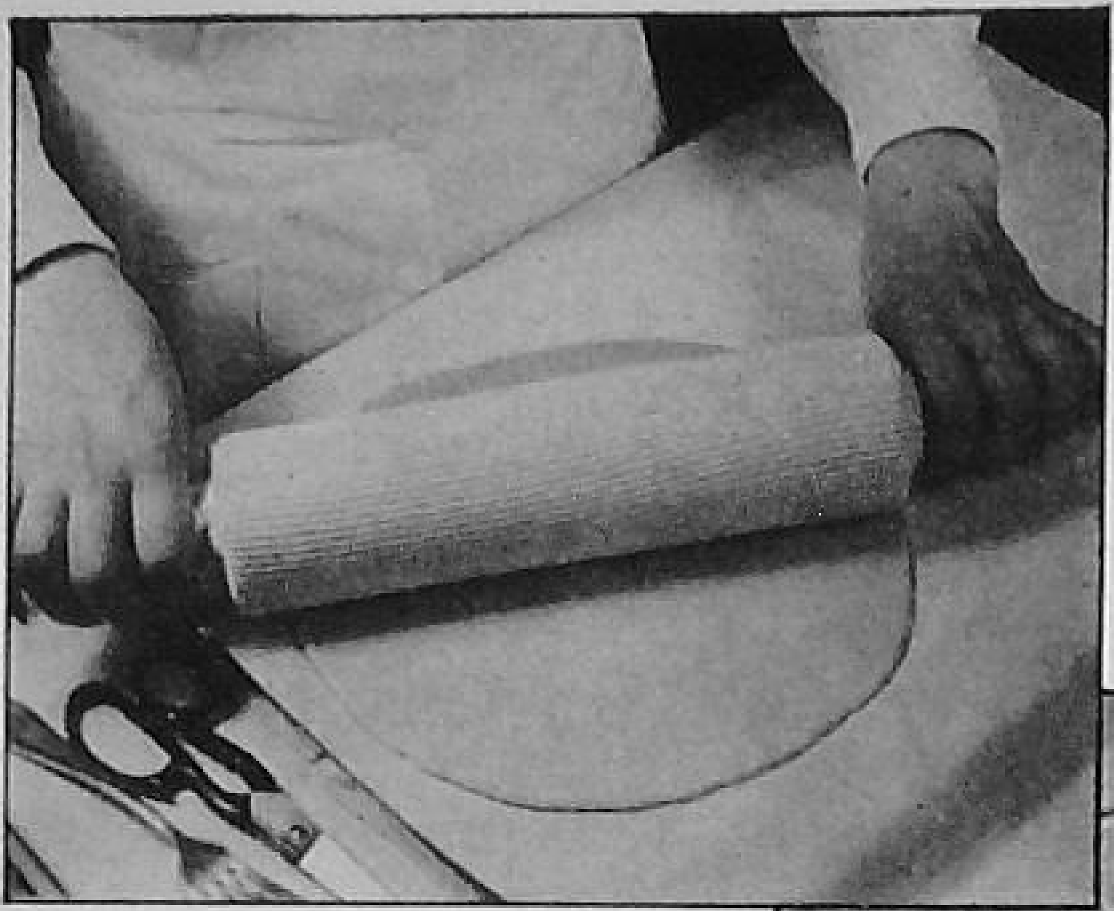
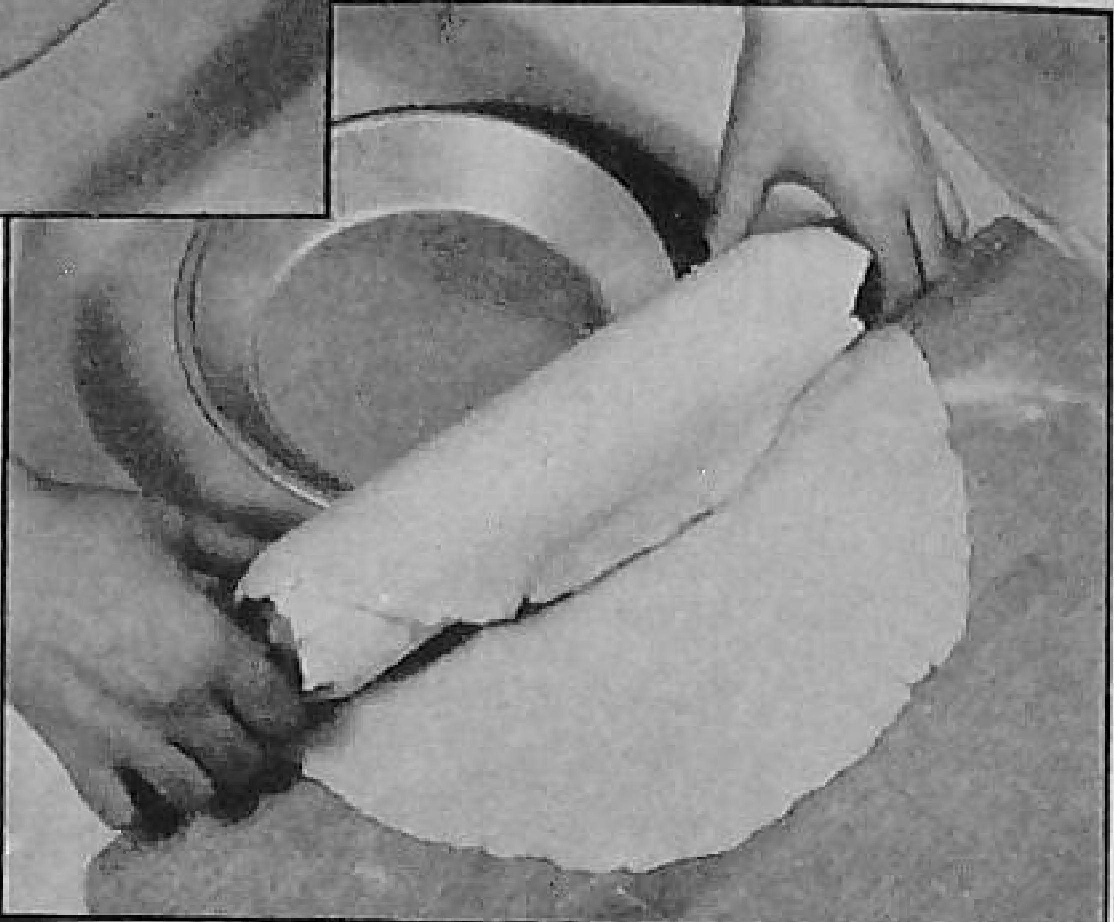
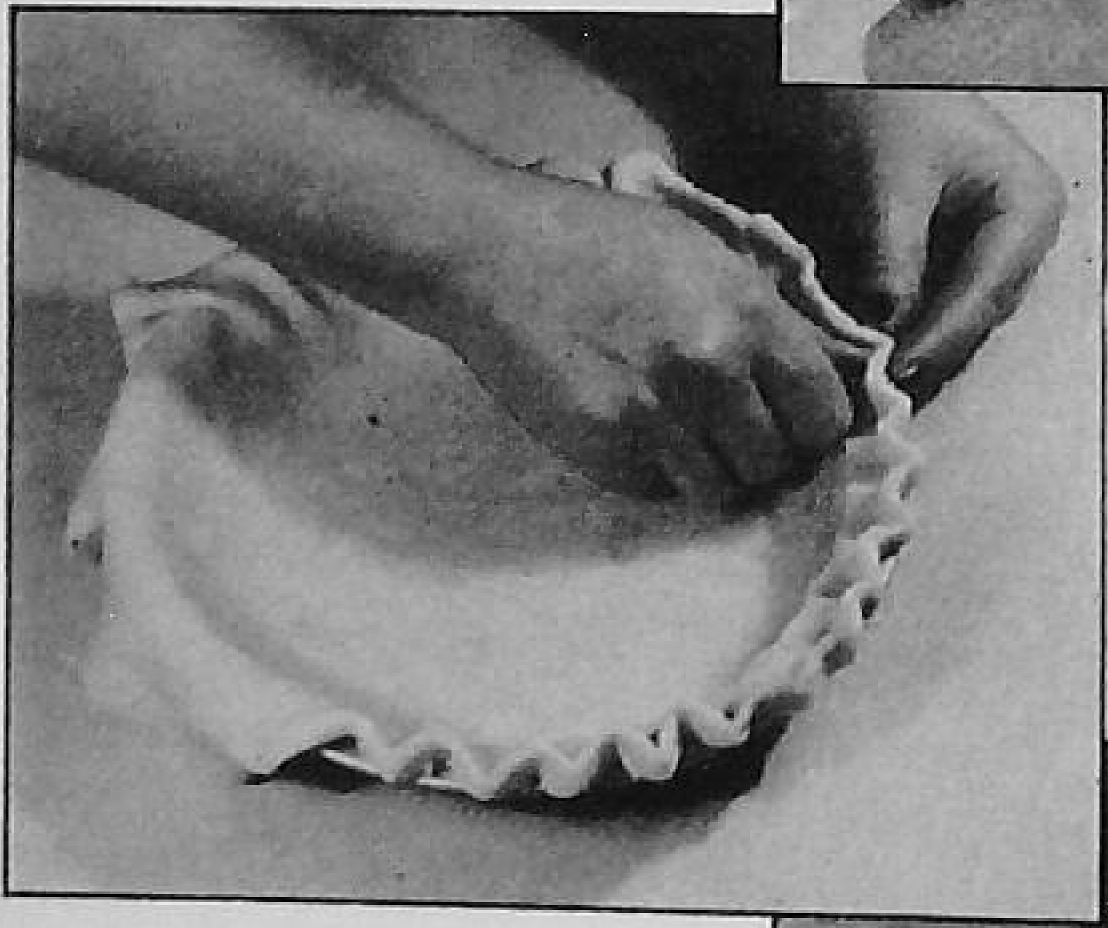


Fig. 83

To shape dough: Use pastry cloth and stockinette. Rub flour into both. Brush off excess. Place dough, shaped as flattened ball, on cloth. Roll gently from center out in all directions. Lift rolling pin at edge to keep uniform thickness.

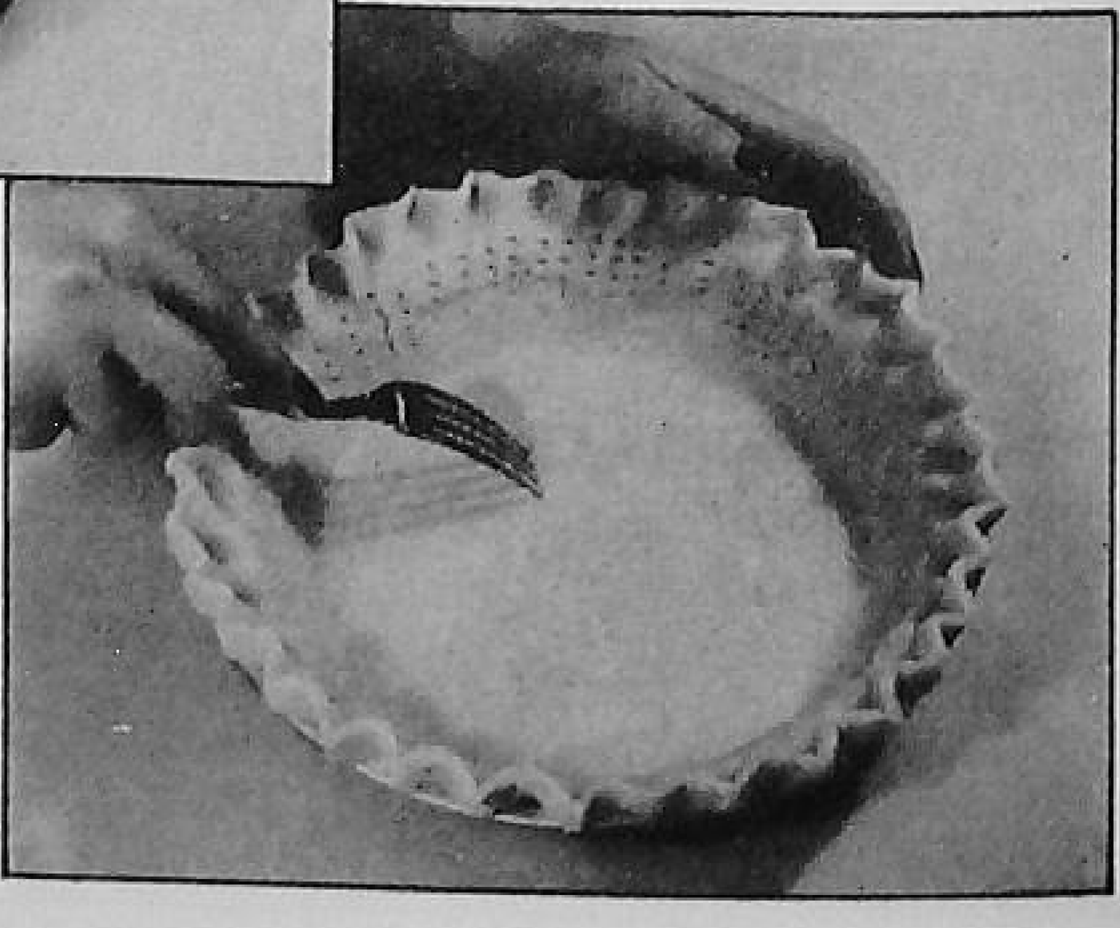
Lay rolling pin in center of pastry shell. Fold pastry over pin so it can be lifted easily from cloth to pie pan. Fit pastry into pan loosely. Do not stretch it. Fit lightly onto bottom and sides of pan. Use kitchen scissors to cut pastry so it extends about one inch over edge of pan.





Fold extra dough under to make ½-inch collar around pan. Flute edge. Take time to shape uniform flutings that are pressed to fit snugly against rim of pan.

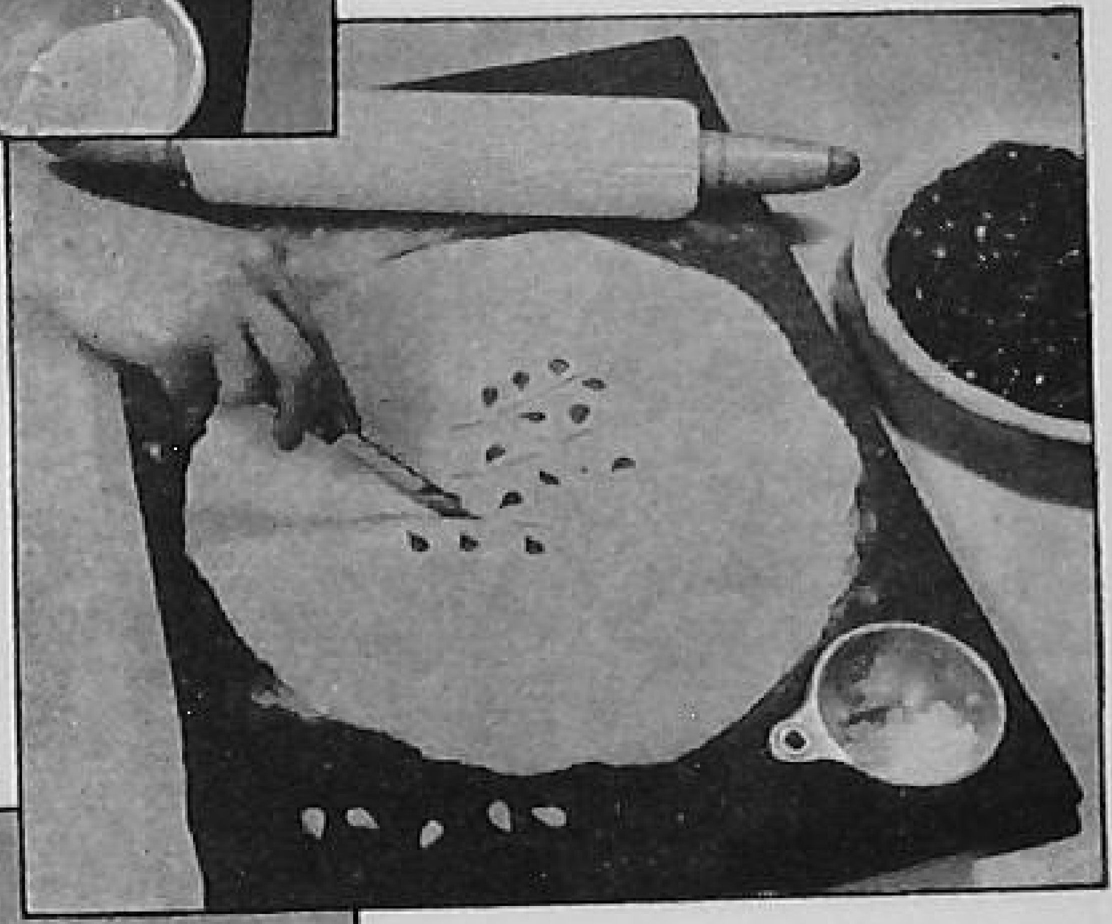
Prick sides and bottom of pastry dough with fork. This will keep pastry from puffing and shriveling as it bakes.



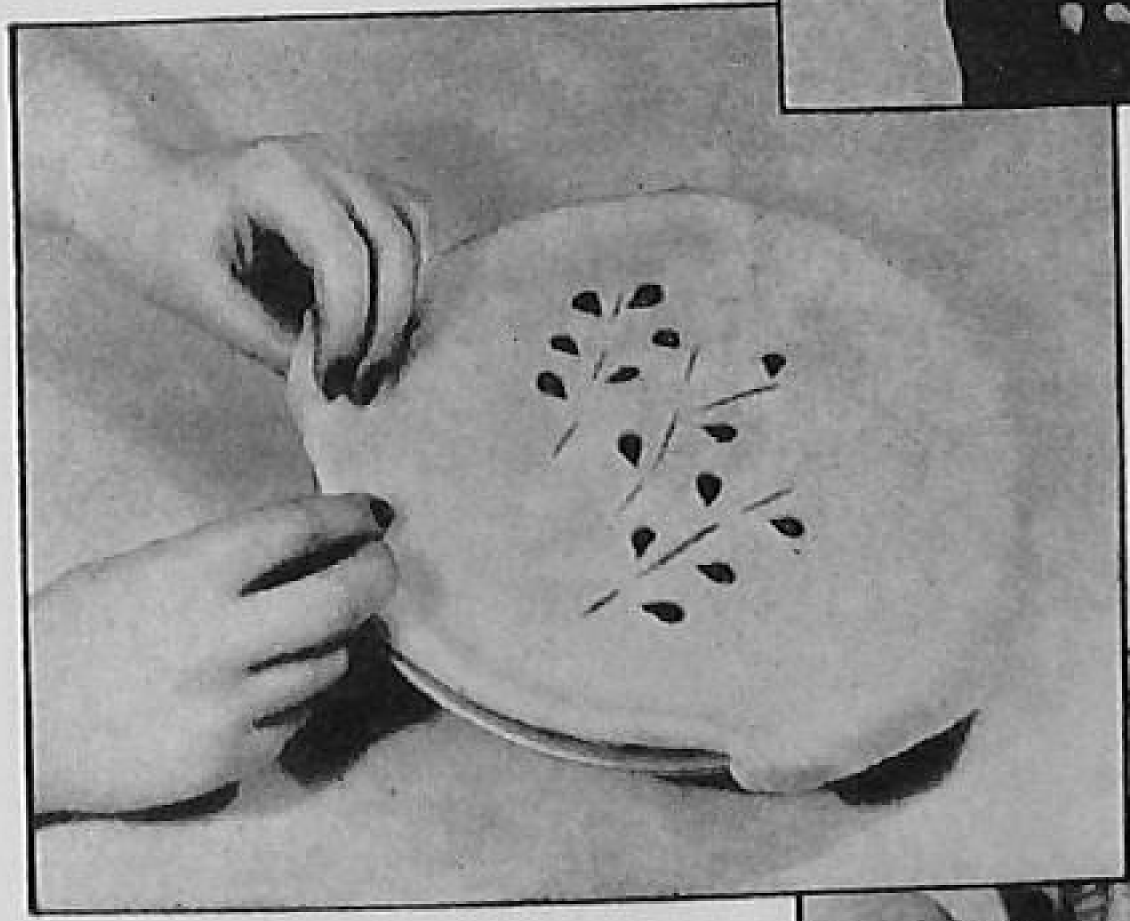
Courtesy of Swift and Company

Fig. 84

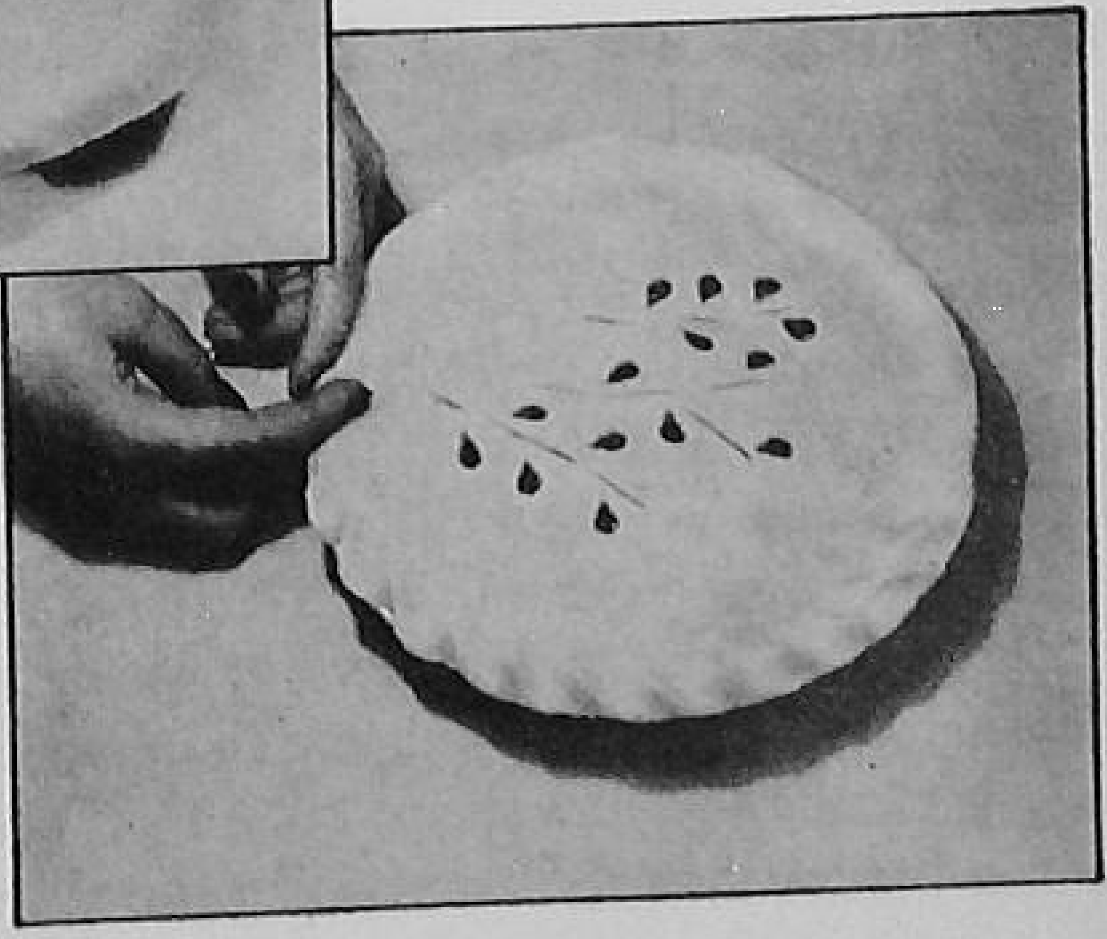
To shape dough for two-crust pie: Roll one ball of dough as for a pastry shell. Fit loosely into pie pan and do not stretch. Trim off dough at edge of pan with knife or scissors. Fill pastry-lined pan.



Roll out top crust, from second ball of dough, into circle 1/8 inch thick and large enough to extend 1/2 inch beyond edge of rim. Cut slits or vents in crust to form an attractive design and to allow escape of steam.



Use rolling pin to lift top crust from pastry cloth onto filled pie. Trim top crust, if necessary, so there is just 1/2 inch of crust beyond edge of pan. Fold top crust under bottom crust at edge.

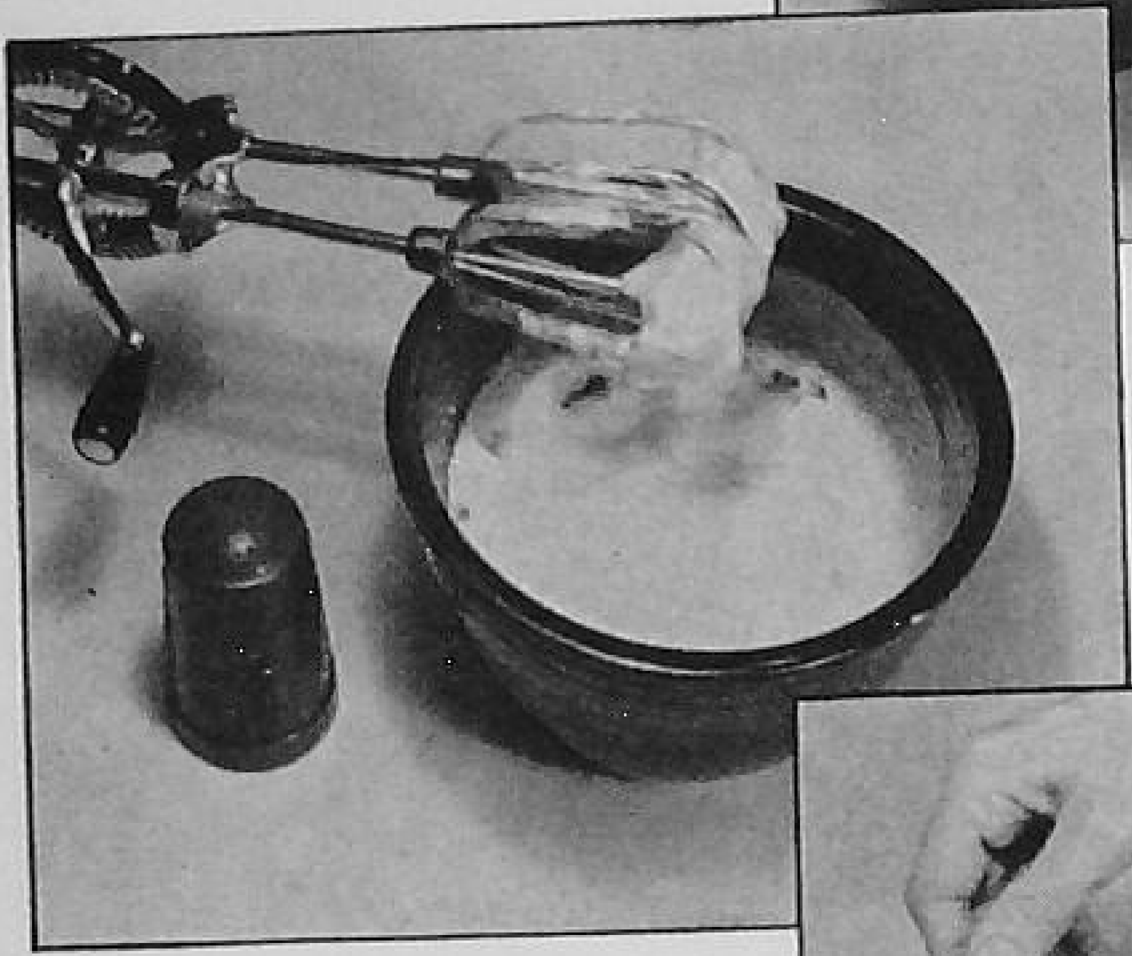


Flute and seal by pressing two crusts together with fingertips as shown here or for pastry shell.

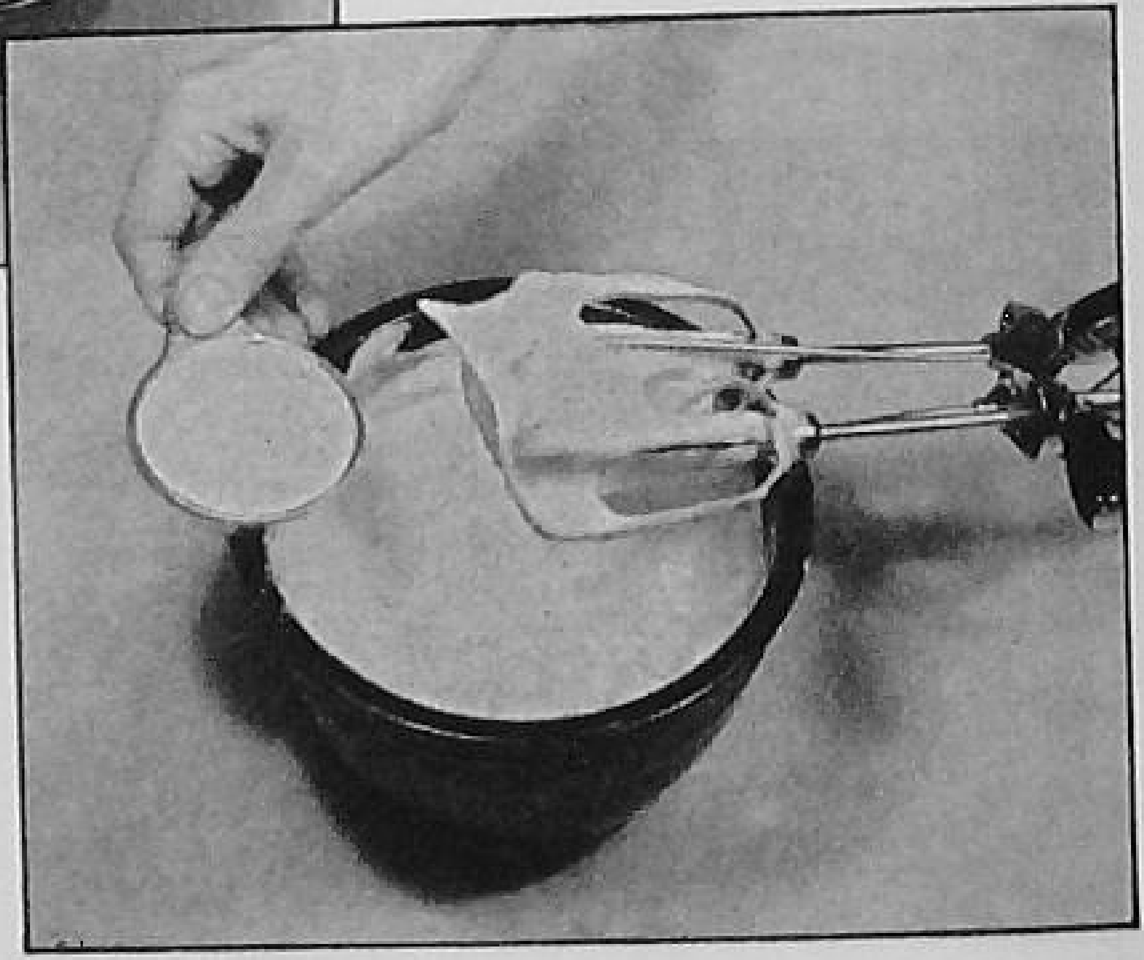
Courtesy of Swift and Company

Fig. 85

Meringues for pies: Break eggs and separate. Eggs separate better at refrigerator temperature. Pour egg whites into mixing bowl. Let egg stand a while. Egg whites beat more readily when at room temperature.

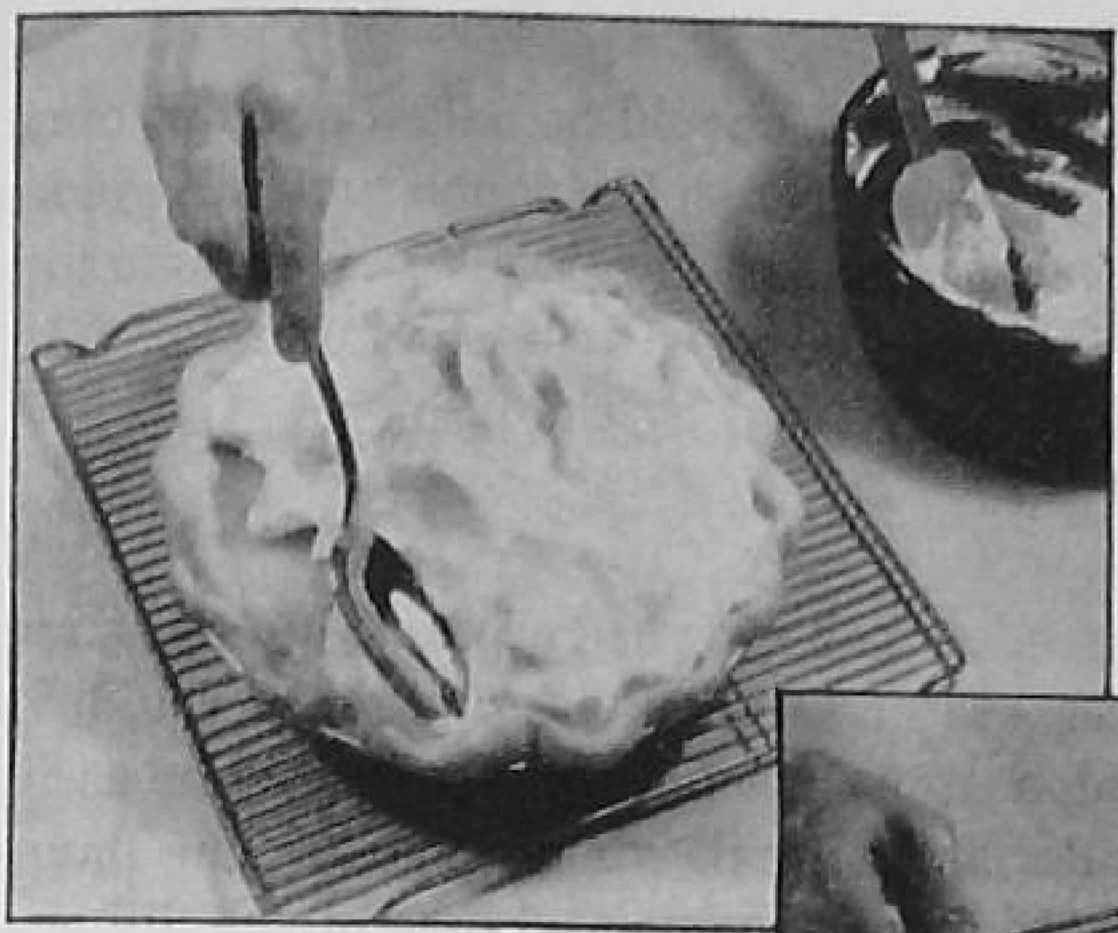


Sprinkle salt over egg whites in mixing bowl. Use a whisk, rotary or electric beater and beat whites until soft peaks form when beater is lifted.

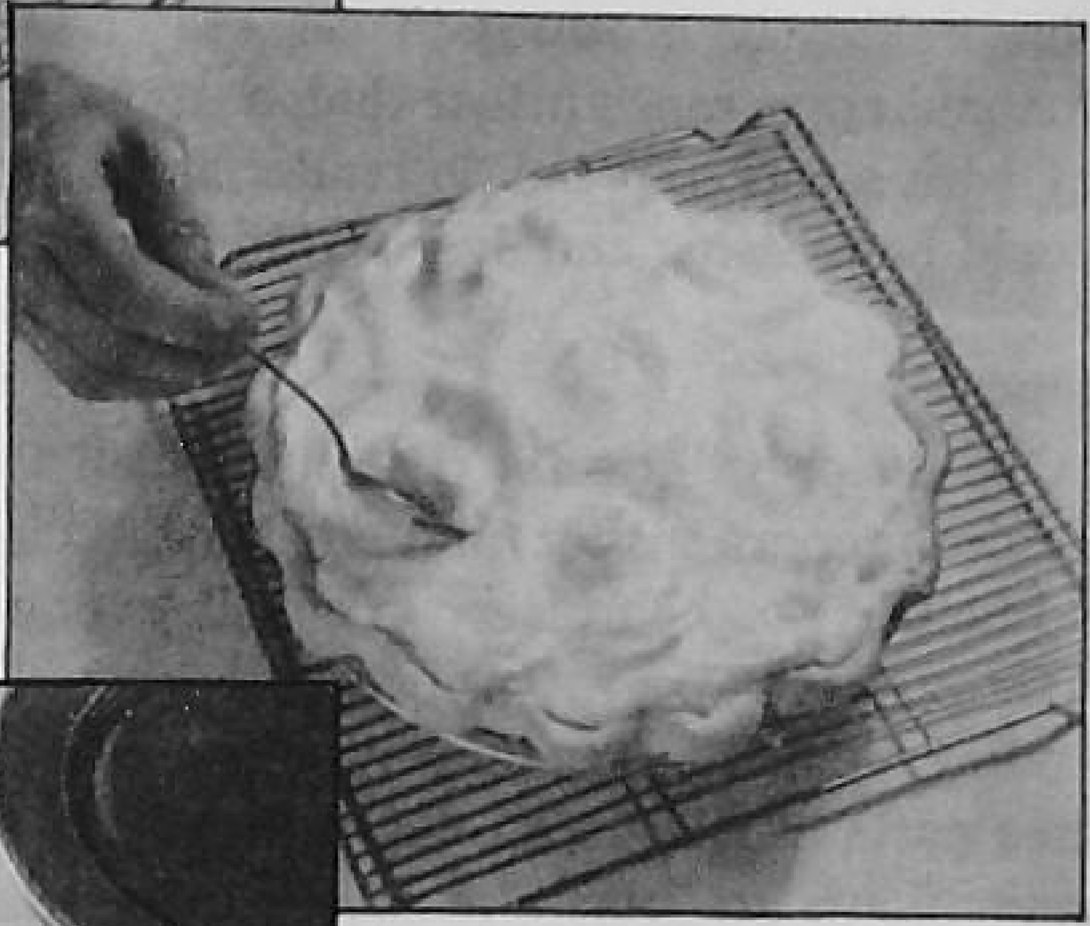


Sprinkle sugar, a little at a time, over whites. Continue to beat until meringue forms in definite peaks. Meringue should shine. If it looks dull and dry, meringue is overbeaten.

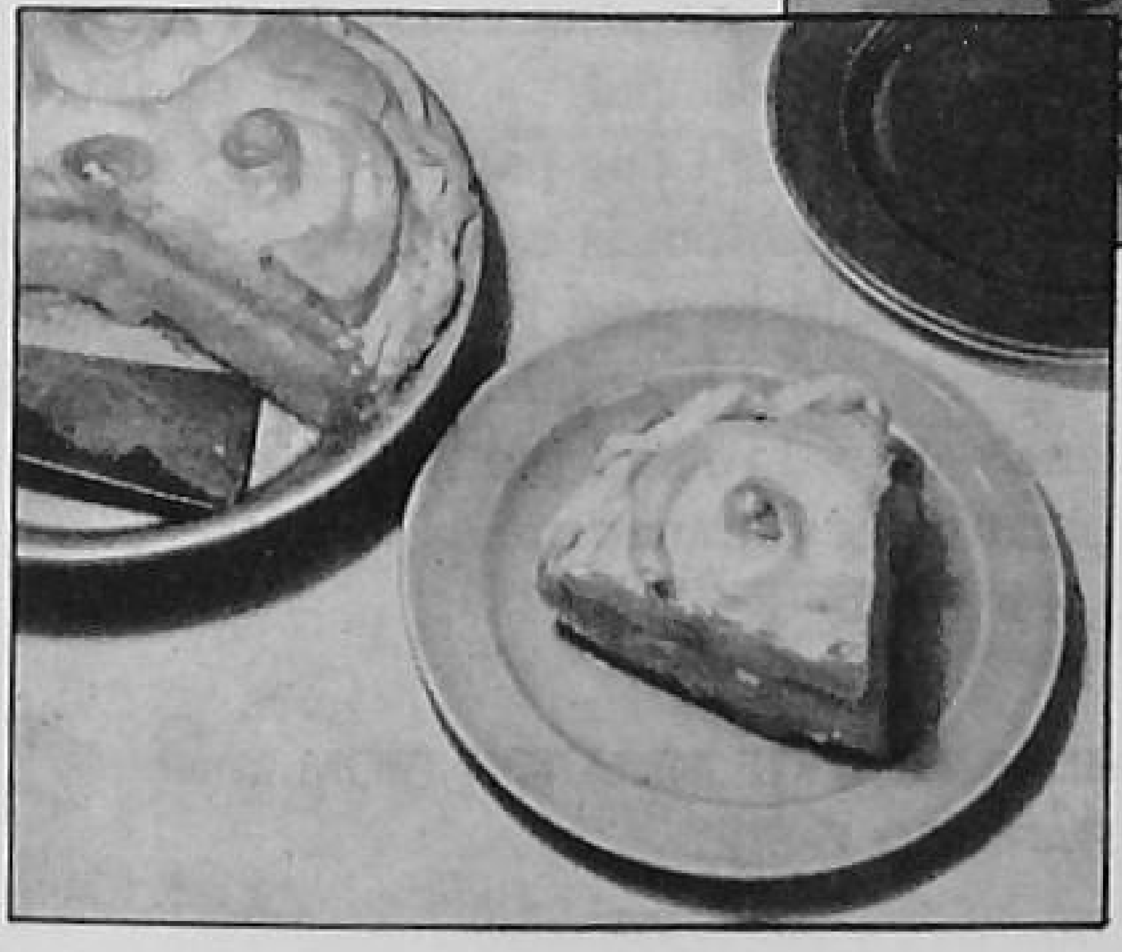
When the crust is rolled to the desired size and thickness, it is ready to place in or on the pan. If the lower crust of a two-crust pie is being made, it is placed inside the pan. If the crust is to be baked before the filling is added, it may be baked either on the inside of the pan or on the outside. In either case, the crust should be large enough to fit well over the pan without stretching and without enclosing any air. If the crust is baked before filling it tends to bulge. To prevent this it is usually pricked with a fork to allow air and steam to escape. Sometimes another pan is placed inside the crust to aid in retaining the shape.



Use a rubber scraper to push meringue out onto pie. Spread meringue over pie with spoon or scraper. Push meringue completely to edge of filling and be sure it touches crust all way around. This will keep meringue from shrinking.



Use back of spoon to make attractive swirls on top of meringue. This makes pie look professional.



Bake until meringue is a delicate brown.

Courtesy of Swift and Company

When a top crust is used, it may be only slightly larger than the pan, just large enough to cover the filling. Before it is put on the pie, several slashes are cut in it to allow the escape of steam formed from the filling. If the edge of the bottom crust is moistened before the top crust is placed on it, the crusts stick together well and there is less likelihood of the juice boiling out. The top and bottom crust may be pressed together either with a fork or with the thumb and forefinger. After this is done, the excess crust is trimmed off, leaving the pastry extending well over the edge of the pan to allow for shrinkage.

Baking

A pastry shell, that is, the unfilled crust, should be baked in a hot oven, 232° C. (450° F.), until it is set or feels firm to the touch and is a golden brown. This requires about twelve minutes. Fruit pies are satisfactory when baked at 219° C. (425° F.) for thirty-five to forty minutes. This gives a well-browned crust that is not soaked by the filling.

Characteristics

Pie crust should be crisp and tender, well browned around the edges, and more delicately browned in the center. It should present a rough or blistered appearance rather than a smooth, solid one. It should be easily cut with a fork but not so tender as to break when served. The flavor should be pleasing and delicate, adding to the palatability of the filling.

Proportions

One recipe will do for the crust of all types of pie. Few recipes give definite proportions for all ingredients. The usual proportion for the salt and flour is one half teaspoon of salt to one cup of flour. The proportion of fat also remains rather constant, though variations may be made depending upon the tenderness of the crust desired. One part of fat to three parts of all-purpose and bread flour, and one part of fat to four of pastry flour, are generally satisfactory. Seldom is a definite proportion of water given. In general, enough should be used just to moisten each particle of flour. The amount depends upon how intimately the fat and flour are mixed, the length of time required to add the water, the way in which it is added, and the temperature of the mixture.

Definite causes of difficulty are listed in Table 55.

TABLE 55. PROBABLE CAUSES OF DEVIATION FROM THE STANDARD PASTRY

Difficulty	Cause	Prevention
Tough crust	Insufficient fat	Increase fat
	Too much water	Add water more slowly, taking care to just moisten each particle of flour
	Overmixing	Do not mix excessively after adding water
	Too much flour on molding board	Have dough stiff, so little or no flour need be added while rolling
	Kneading	Usually necessary when too much water is added. Press particles of moistened flour and fat together

Difficulty	Cause	Prevention
Solid crust	Insufficient fat	Same as for tough crust
	Overmixing	Leave fat in fairly large particles Do not mix intimately
	Overmixing	Same as for tough crust
	Kneading	Same as for tough crust
	Too slow oven	Start at 219° C. (425° F.) or 232° C. (450° F.)
Does not brown	Solid crust	Same as for tough crust
	Oven too slow	Start at 219° C. (425° F.) or 232° C. (450° F.)
Soggy lower crust; top all right	Too slow oven	Start at 219° C. (425° F.)
	Uneven distribution of oven temperature; pie baked too high in oven	Place pie in oven so both top and bottom bake
	Too much filling	Adjust proportions
	Filling too moist	Thicken juice of canned fruits before filling in pastry. Mix fresh cherries or berries with flour or cornstarch
	Bottom crust not handled properly	Follow acceptable practices for handling crust
	Soaked before baking starts	Add filling immediately before putting in oven Partially bake crust before adding filling Sprinkle a thin layer of flour over lower crust Coat lower crust with uncooked egg white Use perforated pie tin
Crust thin, brittle, burns easily	Too much shortening; pastry rolled too thin	Adjust proportions Roll to proper thickness
Crust thick, soft, doughy	Too much water	Adjust proportions
	Too little fat	Adjust proportions
	Water and fat not cold enough	Keep ingredients cold
	Too slow an oven	Bake at 219° C. (425° F.) or 232° C. (450° F.)
	Pastry rolled too thick	Roll to proper thickness

Pastry shell blisters	Pastry fitted too tightly in pan	Fit crust into pan loosely, removing any enclosed air
	Not pricked enough	Prick sufficiently to allow enclosed air to escape
	Too slow an oven	Bake at 232° C. (450° F.)
Shrinks in pan	Unbalanced recipe	Adjust proportions
	Too much handling	Mix just enough to combine ingredients
	Too slow an oven	Bake at 232° C. (450° F.)
	Pastry stretched tightly in pan	Fit crust into pan loosely
	Dough stored too long in refrigerator	Do not keep dough too long

ACTIVITIES

1. Prepare open-faced pies, selecting from among the following:
   - Banana cream pie
   - Butterscotch pie
   - Chocolate pie
   - Coconut cream pie
   - Cream pie
   - Date cream pie
   - Lemon pie
   - Orange pie
2. Prepare fruit pies with a top crust, selecting from among the following:
   - Apple
   - Berry
   - Cherry
   - Rhubarb
3. Make cheese straws, using a pastry basis.

Refer to *Practical Cookery*, "Pastry," pp. 206–214; Heseltine and Dow, *The Basic Cook Book*, "Pies and Pastry," pp. 560–578.

REFERENCES

American Home Economics Association, *Handbook of Food Preparation.* Washington, D.C., 1954.

Blanck, Fred C., ed., *Handbook of Food and Agriculture.* New York: Reinhold Publishing Corporation, 1955.

Department of Foods and Nutrition, Kansas State College, *Practical Cookery and the Etiquette and Service of the Table.* New York: John Wiley and Sons, Inc., 1956.

Halliday, Evelyn G., and Isabel T. Noble, *Hows and Whys of Cooking*. Chicago: The University of Chicago Press, 1946.

Heseltine, Marjorie, and Ula M. Dow, *The Basic Cook Book*. Boston: Houghton Mifflin Company, 1947.

Lowe, Belle, *Experimental Cookery*, Fourth edition. New York: John Wiley and Sons, Inc., 1955.

Miller, Madge and Mary Barnhart, *Essentials of Food Preparation*. Dubuque, Iowa: Wm. C. Brown Company, 1947.

Stanley, Louise, and Jessie Alice Cline, *Foods: Their Selection and Preparation*, Revised edition. Boston: Ginn and Company, 1950.

Sweetman, Marion Deyoe, and Ingeborg MacKellar, *Food Selection and Preparation*, Fourth edition. New York: John Wiley and Sons, Inc., 1954.

Todoroff, Alexander, *Food Buyer's Information Book*. Chicago: Grocery Trade Publishing House, 1946.

Ward, Artemas, *The Encyclopedia of Foods*. New York: The Baker and Taylor Company, 1929. Reprinted 1941, Peter Smith.

Unit Three

UNIT THREE

Marketing for Our Food

Courtesy of The Kroger Food Foundation

IN PIONEER DAYS in this country each home met its food needs largely through its own production. Wheat and corn from the fields supplied the flour and meal. Pork and beef were furnished by the farm animals. The orchard yielded fruit both for immediate consumption and for storage for winter months. The vegetable garden met the summer needs, and supplied cucumbers for pickling, sweet corn and beans for drying and "salting down," as well as potatoes, sweet potatoes, carrots, turnips, and onions to be stored for winter use. Home storage, most important then, made possible adequate provision for family needs out of the foods produced by the family.

In general, each family decided, in the light of past experiences, the varieties and quantity of each product that would best meet its yearly needs. The food purchases then included some seeds for planting, and the sugar, salt, spices, coffee, and flavorings that could not be produced at home. From the raw foodstuffs of the farm the homemaker made cakes, pies, bread, salad dressings, cured meats, and many other food products in her own kitchen under conditions of sanitation for which she was responsible. Whenever a product fell below her standard, she knew the reason; perhaps "the cream was too sour," "the oven was too hot," or "the sugar was too scant." Her family accepted her handiwork, presumably with understanding and appreciation.

Recent years have brought a marked change in the activities of the home. Relatively few homes today produce foods for family needs to the degree that was common in pioneer times. The growth of the baking industry, which now supplies the home with breads, cakes, pies, and doughnuts, affords proof of this statement, as does the growth of the canned and frozen food and the meat packing industries. In the case of processed and prepared foods, the homemaker and the members of her family may no longer have personal knowledge of the soundness of the original food, of the sanitary conditions under which it was prepared, of other substances that may have been added as adulterants, or of the length of time that may have elapsed between the processing and preparation of a

given food and its appearance upon the table. The complexity of the present situation requires both intelligence and education to provide for wise purchasing of the family's food.

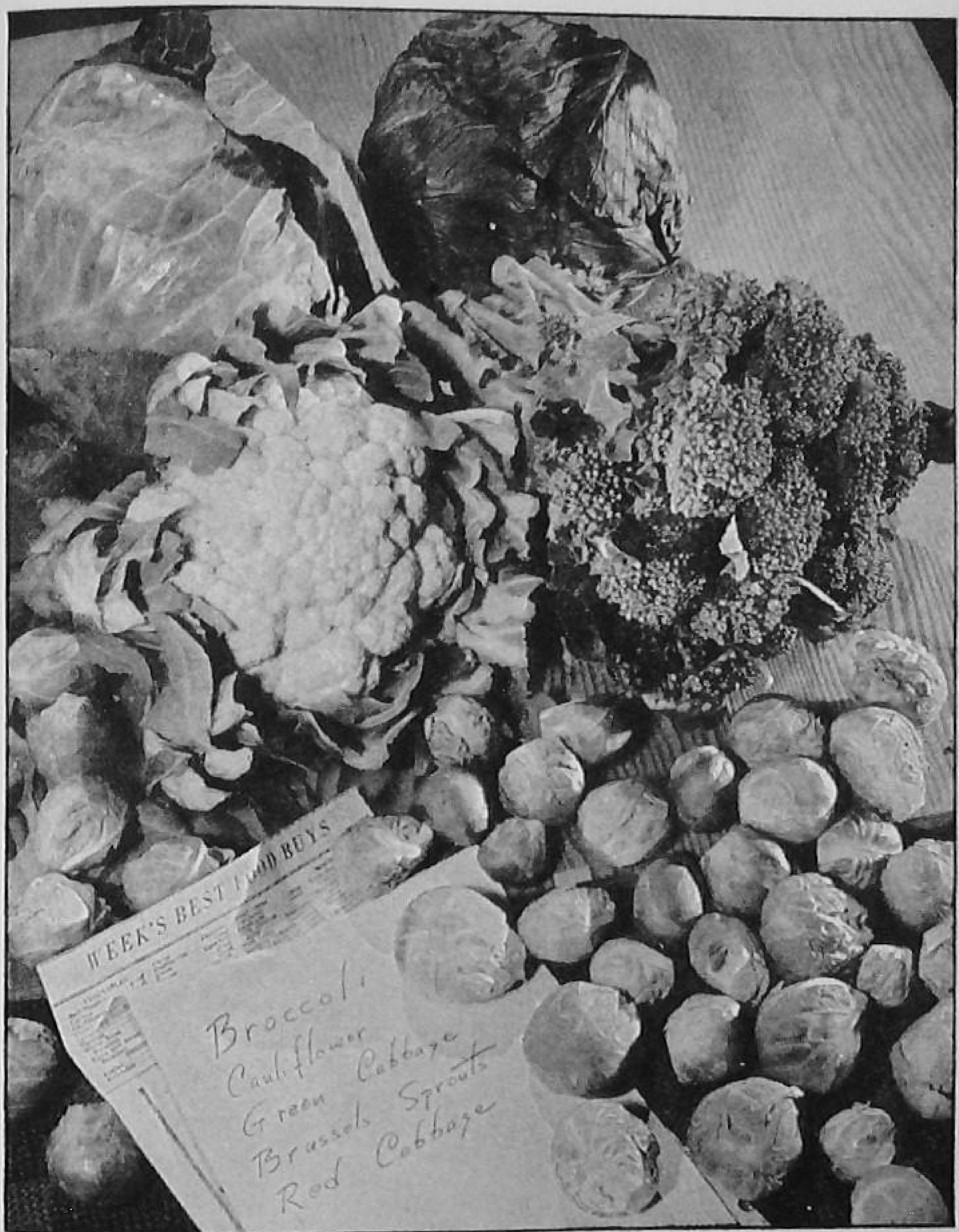
PROBLEM 1 *What are woman's responsibilities as a buyer of food?*

The fact that the purchase of food is a responsibility carried largely by women is evidenced by any grocery store at its busy hour. Women, both old and young, observant and casual, throng its aisles and far outnumber the men. Often those men who are there seem somewhat confused as they strive, assisted by a grocery list written in feminine script, to place the order for the family's supplies. Fifty or more years ago the situation was reversed. The man of the house did practically all of the purchasing. Some women boasted that they went to the store less than once during the month, smugly emphasizing their attitude by the statement that "It was the man's place to get the food, the woman's place to cook it." The woman of today, charged with the expenditure of eighty-five per cent or more of the family's income, may look back on her grandmother and wonder at her lack of interest in assuming economic responsibility.

Purchasing power is a responsibility, important and real. Whether used wisely or poorly, it affects the homemaker, her home, and her nation. It should benefit the family for which she shops, and the nation for whose citizens she buys. From one third to one half of the money she expends normally goes for food; she should therefore be careful to choose the right kinds and the right quantities.

Wise purchasing

It is essential that the family be supplied with nourishing, palatable, wholesome food. This is made possible by a wise expenditure of the money allotted. The tastes of the various members of the family must be considered if food is to yield the most satisfaction to all. To gratify the tastes of the family, without in any way affecting the adequacy of the diet furnished, is not easy, but it is necessary. A knowledge of the amount



Courtesy of Western Growers Association

Fig. 86

The efficient homemaker looks for good buys when purchasing foods.

of each food needed to serve the family is a phase of this responsibility. Buying more than the family actually needs is a wasteful practice, and the excess expenditure gives little return in satisfaction to anyone.

Another phase of the woman buyer's responsibility toward her family is that of obtaining variety in the food purchased. It is largely her choice of foods that determines the food habits of the family, and hence the market for various foods in the community. If she buys "meat and potatoes," the family usually accepts her choice, and its food habits are thus built. If she buys to meet dietary needs, and frequently purchases vegetables and fruits, including new and widely varied kinds, the food habits of the family reflect her wisdom. The homemaker thus has a responsibility to use her power to change, through a wider use of various foods, a provincial and inadequate diet into a cosmopolitan and adequate one. The stock of any grocery store reflects directly the demands of those who shop there. If there is an insistent demand for green beans, they will be on hand. If there are requests for fresh cauliflower out of season, the vegetable counter will display this food. The demands of the buyer are of great importance in determining the market.

The woman shopper may also determine the hygienic conditions in the stores or markets of her community. If she is satisfied with low standards, she may have only a low-grade market in which to buy. If she insists on high standards, the market will meet her demands in order to retain her trade. The merchant must meet the demands and requirements of his customers in order to be successful in business. The homemaker is responsible for the demands on the market for various qualities of food. Whether a high or low quality is available depends upon her buying. The choice between different qualities of food should be made in relation to the intended use of the food. Knowledge and use of available specifications established for the different grades of food are helpful in determining quality.

Making good buys in purchasing food is an important responsibility of the homemaker for thereby effective use is made of the family's food money. Certain foods tend to be good buys all of the time but most foods vary from time to time in this respect. The wise buyer tries to be well informed in the matter and to do her best to have her purchases all good buys.

Correct weights and measures

The woman buyer has the further responsibility of seeing that she receives the correct weight or measure of the food she orders. The gov-

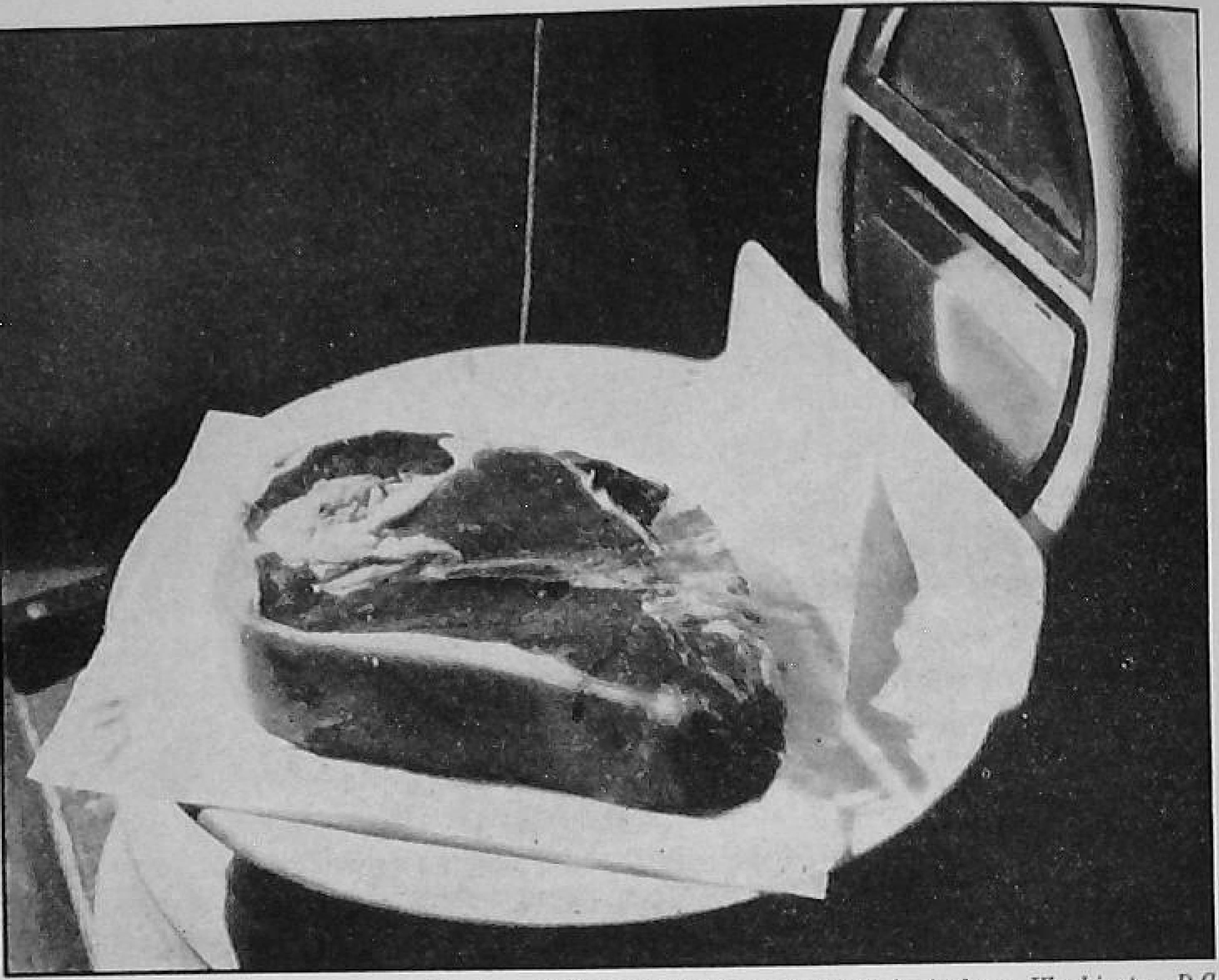
ernment has established legal standards for weights and measures. In each state and in the large cities there are inspectors whose duty it is to see that these are maintained. As a matter of good business, the purchaser should receive the amount for which she pays. As a citizen she should see that these regulations for the benefit of consumers really function in her community.

In addition to making occasional checks of her purchases on reliable scales in her own home, the homemaker should make sure that the grocer's scales are balanced before he begins to weigh her purchase, and that his hand, a paper tray, or a heavy sack does not enter into the weight ascribed to the food she is buying. The idea of purchase by weight of many commodities usually sold by number or measure is growing — for example, the practice of selling by weight various fruits and vegetables formerly sold by the dozen. Because weights are more definite as to food-quantities than numbers, and can be checked on the scales, it would seem desirable to encourage this more exact mode of purchasing.

Courtesy of The Kroger Food Foundation

Fig. 87

Markets, large and small, offer the shopper a wide choice of attractive and well displayed fresh vegetables.



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 88

Correct weight is an important consideration in buying food. Homemakers, and others too, should make sure their purchases are right in this respect.

Pure-food laws

The homemaker has also a responsibility both to her family and to her nation to make sure that the food which she purchases complies with the pure-food laws. By their terms food must be, among other things, clean and free from any injurious ingredients that might be added as a preservative. No valuable part of the food may be removed, nor may other substances be substituted in whole or in part for the food offered. The label must not mislead the purchaser. The quantity of contents contained in the package must be marked on the package in terms of weight, measure, or numerical count. The passage of pure-food laws such as the Federal Food and Drug Act of 1906, which specified these requirements, has done much to save the buyer from tainted, poisonous, and mislabeled food. The Federal Food, Drug, and Cosmetic Act of 1938 and subsequent

amendments which go much further in their protective measures, along with the various interpretive and regulatory measures adopted by the Food and Drug Administration, are doing much more in this regard. Though these acts apply only to foods sold in the District of Columbia, to those transported in interstate commerce, and to those sold to United States Government Agencies, they have served as a pattern for state legislation of this type. Among the important provisions that relate to foods are the following:

1. Prohibits traffic in food which may be injurious to health.
2. Prohibits the addition of poison to food except where such addition is required in its production and cannot be avoided by good manufacturing processes. Where such is the case, as with sprayed fruits and vegetables, maximum amounts of tolerance may be specified by the Secretary of Health, Education and Welfare.
3. Authorizes power to prohibit traffic in contaminated foods injurious to health.
4. Prohibits traffic in confectionery containing metal trinkets and other inedible substances.
5. Requires specific label declaration of artificial coloring and flavoring and chemical preservatives in food, with the exception of artificial coloring in butter, cheese, and ice cream.
6. Requires labeling of special dietary food to inform purchaser fully of its vitamin, mineral, and other dietary properties.
7. Provides for the promulgation of a definition and standard of identity and a reasonable (minimum) standard of quality and fill of container for each food other than dried fruits — except avocados, cantaloupes, citrus fruits, and melons — and fresh or dried vegetables. Butter is exempted also because a law in 1923 made regulations for butter.
8. Requires the labeling of food for which no definition and standard of identity has been fixed, and which contains more than a single ingredient, in order to disclose the ingredients by name, except spices, colorings, and flavorings which are so declared.
9. Proscribes the use of containers which might render the food contents injurious to health.
10. Provides for the extension of supervisory inspection to the sea-food packing industry at the request of the packer.
11. Prohibits the traffic of mislabeled and adulterated food.

It is hoped that all states will strengthen their food laws and regulations to give their citizens the best protection possible. The responsibility falls upon the purchaser to see that in the foods selected there are none that violate these laws. Dealers who handle foods in violation of law

should be reported to the proper authority for investigation and prosecution.

The national food situation

As a good citizen and a wise purchaser, the homemaker has the added responsibility of buying her food in relation to the national food situation. This problem is more acute at times than at others, as for example in wartime when food must be consumed in accordance with the best interests of the national economy. Though various means are used to accomplish this, government rationing of food is one of the most effective measures followed. Through it, scarce foods are shared, and eating habits and other food practices quickly changed or modified. At any time a low production of a given food that is widely used may necessitate its replacement by one that has a relatively large production. It is frequently unwise, from both the personal and the national viewpoint, to maintain the accustomed use of a food that must be obtained at an extremely high cost instead of replacing it with an equivalent inexpensive food commodity at hand.

The price of food often varies with the season. Certain foods are higher priced at one time of year than at another. Oranges are cheaper in December and January than in June and July; butter and eggs are usually most expensive in the winter; fresh peaches are lower in price in the late summer months. Increased cold storage, new methods of preservation, and improved transportation facilities have made available foods from many localities and have also brought many seasonal foods onto the market throughout the year. As a rule, however, a food is cheapest in the locality where it is produced, at the time of greatest production.

Increased demand for a food may affect its price. This is especially true if the supply is limited. An increased demand may result through advertising by the producer or distributor and through a better understanding of the nutritive value. This demand may last for a short time only, or it may be relatively permanent. Recognition of the part advertising may play in increasing the demand is given by the yearly expenditure of millions of dollars for the advertising of food products. It has been said of advertising: "There is no other means by which to single out a particular dealer's goods from the general run of goods and attract unusual permanent attention to them. The tactics of creating demand for high-priced goods by use of advertised brands is mainly a matter of understanding social psychology. Dealers who can cultivate shrewdly the

Courtesy of Western Growers Association

Fig. 89

Fresh vegetables and fruits in top condition are the best to purchase. Their additional cost is offset by the minimum waste involved.

instinctive demands of people who are heavily susceptible to psychological traits of display, prestige, imitation, rivalry, pride, vanity, ostentation, and suggestion hold a clue to the building of a market for their wares at prices well above the general market level." [1]

Common knowledge that a food is rich in certain nutrients often increases the demand for it and frequently the price. For example, liver trebled in price when it was found to be especially high in nutritive value and important in the treatment of pernicious anemia. There are though many less expensive foods of high nutritive value that have not been so affected.

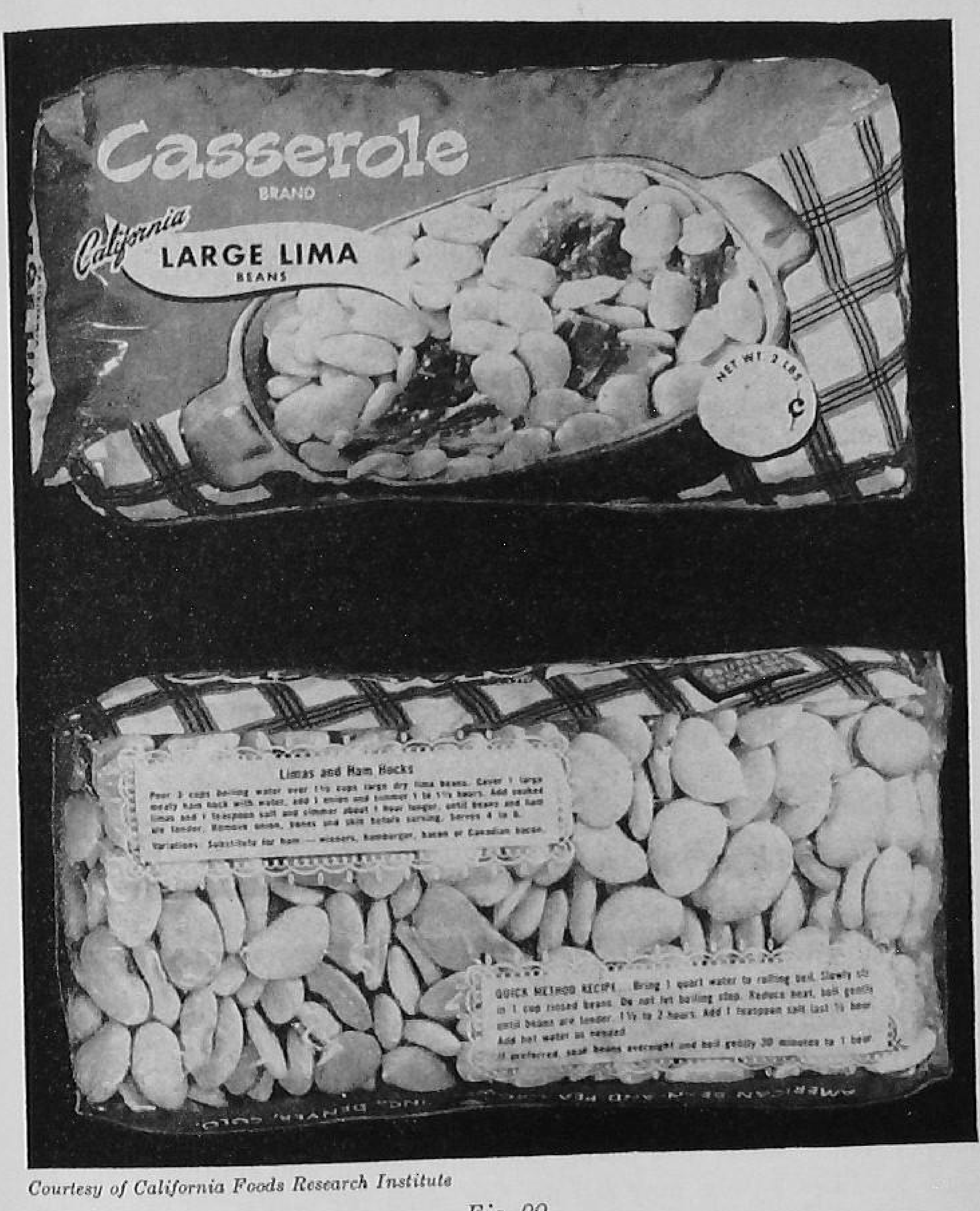
Quality

The quality of food affects its price; food of high quality usually costs more than that of low. As the quantity of food of highest quality is limited, its price is naturally greater than that of lower qualities, of which the supply is greater. If the homemaker always purchases the highest quality of all foods, her grocery bill will be unnecessarily large. A low-quality food does not necessarily mean one unfit for consumption. It may be unsuited for certain purposes and still be desirable for others. For example, a low quality of meat may be most unsatisfactory for broiling and yet highly desirable for making soup or stews. Sometimes a lower quality may be better for a given purpose than the higher quality in common use. Thus if properly cooked a much juicier and tastier product may result from a Swiss steak made from a U.S. Good cut instead of the U.S. Prime. However, apparent economy in the purchase of the lower qualities may be offset by waste due to poor condition, to increased time required for preparation, and to greater amount of fuel used in cooking. Food of low quality at a seemingly low price frequently proves to be an expensive purchase in the end. On the other hand, such a purchase may represent real economy.

Packaged food

Much of the food purchased in stores today is packaged in some form or other. This of course increases the price somewhat but packaging of food offers advantages for which consumers seemingly wish to pay and regard as worth the additional cost. Packaged food is cleaner, more attractive in appearance, and more uniform in quality. Packaging reduces or delays spoilage and provides a convenient container for storing food.

[1] L. D. Edie, *Principles of the New Economics*, pp. 326–27. New York: Thomas Crowell Company, 1922.



Courtesy of California Foods Research Institute

Fig. 90

Fancy packaging of lima beans.

The brand and a statement of any adulterations are indicated on the label, which also includes other information of value to the consumer. The size of the package many times affects the price of the product as in the case of cereal packed in individual servings. Homemakers purchasing their cereals in this form pay over 110 per cent more per pound than if they were buying the same product in the giant economy boxes. Fancy packaging too, usually adds to the price of a food. In any case the purchaser must decide if the advantages obtained are worth the additional cost.

ACTIVITIES

1. Class compile a list of desirable practices to follow in purchasing food.
2. Ascertain the aids available to people buying food for personal and family use. Decide what use homemakers should make of each of these.
3. Review the Federal Food, Drug and Cosmetic Act of 1938 and its subsequent measures. In what ways does this Act need strengthening? In what ways are the food laws of your state better or less effective than the Federal laws?
4. Cite instances when the national food situation affected the purchasing of food. Give an example of how the food situation in another country affected the purchasing of food in this country.
5. Class decide the characteristics of good buys in food.

PROBLEM 2 *What affects the price of food?*

The prices of foods vary so markedly from time to time that it seems as if the price of no food is constant. Fluctuations may be great or they may be small. If the price of eggs today is compared with that of a year ago, the increase or decrease may be as great as 100 per cent or as low as one per cent. Butter may be one price this month, and another next. In some localities lettuce may sell for five cents per pound; in others, for twenty-five cents. Oranges may cost more in one city than apples, and in another city apples may be the more expensive. Caviar may be an inexpensive food in Finland, but a costly delicacy in the United States.

Because of these variations in cost, the homemaker has an added problem in meeting her responsibility as an intelligent buyer for her household. She must be informed on current food prices and their relative

values. She must also understand, to some extent, the reasons for price fluctuations. Thus she will be better able to purchase intelligently.

Supply and demand

The price of any commodity is determined chiefly by its supply and demand. Other things being equal, the greater the supply the lower will be the price, and the greater the demand, the higher will be the price. Because many factors influence supply and demand, the problem is much more complicated than at first appears. Also, the influence of supply and demand upon price may be modified or limited in varying degrees by government subsidies, price controls, and other regulations. Although cost of production, difficulty of production, weather, and fashion may seem to be factors of a different kind, a careful study shows that they are really a part of supply and demand, and that they cannot be considered separately.

One of the first factors of importance in controlling price is the size of the crop or the amount of the commodity produced. An abundance of even a much desired product means a somewhat lowered price. This, of course, is particularly true when the total world supply is considered. It is possible for a food to have a low price in a community where an abundance is produced and a high one in distant markets because the total crop is short. Frequently, the availability and ease of transportation exert an influence. Especially is this the case in localities which have an abundant supply but no means of bringing it to the markets where the supply is scarce and the demand is great. Then, too, some products cannot be transported easily. Adequate facilities of transportation and refrigeration have tended to equalize the price of foods throughout the civilized world but may also have added to the price of food. If the products are difficult and costly to transport, the selling price must cover this expense.

Partially prepared and ready-to-serve foods

The demand for foods that are easily and quickly prepared has resulted in a wide array of partially prepared and ready-to-serve foods that are constantly increasing in kinds and quantity. Mixes of all types, that within a short time may be cakes, icings, puddings and sauces, line the shelves of every grocery store. Frozen foods ready for a few minutes of boiling or steaming, frying in deep fat, or oven browning or baking, and frozen meals requiring only oven heating for a brief period to be ready for eating fill the stores' freezer cabinets. Frozen and canned fruit juices

that are practically ready for serving are favorite choices of the shoppers. Salad dressings once made in every home have taken their place along with bread and other baked products generally purchased at the store. Jellies, preserves, and pickles, too, are frequently bought as are potato chips and French fried potatoes and onions. Many girls and women have never dressed a fowl and purchase only one that is ready to cook. A short stay in a modern grocery store soon reveals how extensively these partially prepared and ready-to-serve foods are used. Though there are some exceptions, these foods tend to be higher in price than those not so treated. The processing, along with the packaging required, add to the cost which must be covered in the selling price. Of course there are advantages in the use of these products which are not to be overlooked. However the homemaker who frequently purchases such foods should ascertain which are really good buys for her and which are luxury purchases that she can ill afford to make.

The type of store

The type of store affects the price of food. The "cash and carry" store that makes no deliveries and has no charge accounts can sell profitably at a lower price than the "charge and deliver" store. The serve- or help-yourself store that needs fewer salespersons can also sell for less. The chain and affiliated independent stores of various types and the independent supermarkets that buy in large quantities may be able to buy commodities at a lower figure than the store that must purchase in smaller lots, and this saving in turn may be reflected in the stores' retail prices. Sometimes food is retailed for less at community markets, where the producer sells his own products. Buying directly from the producer usually lessens the price. However, there are other items to consider than the retail price of the food. The time and energy of the shopper, the transportation of the purchaser and of the foods purchased, the quality of the product, and the services given should all be considered in deciding the place of purchase.

General market conditions

General market conditions have a decided effect upon food prices. This is especially shown on those of foods generally consumed by all people. Prices of flour, eggs, meat, butter, milk, potatoes, and the like all tend to follow prevailing market prices. Of course, the price for all foods is influenced by market prices, but the price of commonly used foods is more generally affected than are the less commonly used ones.

ACTIVITIES

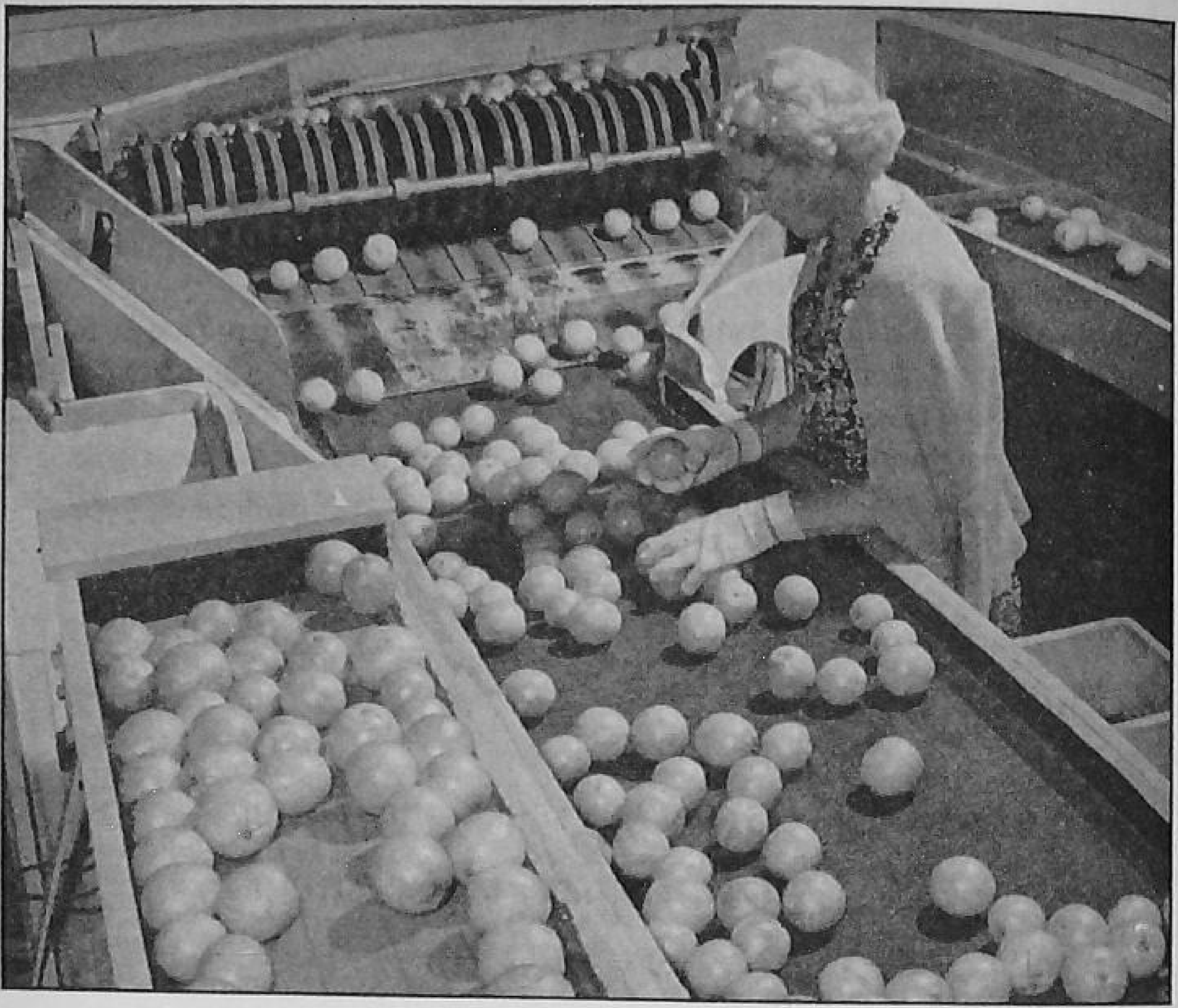
1. Compare the prices for a number of foods at different types of stores. How much do these vary? What are some probable reasons for this?
2. Each class member select a given food. Compare the prices of the different forms in which this food is marketed as fresh, canned, dried, frozen, ready-to-cook or eat or precooked, and/or special packaged. What may make the difference in prices? When would you purchase each?
3. Forming into groups of two, select five foods and note the fluctuations in price for the four seasons of the past year. Obtain information from the inventories and records of the Department of Home Economics or of Food and Nutrition in your college. Suggest possible reasons for any fluctuations.
4. Participate in a class discussion on ways to reduce food expenditures without lessening the adequacy and attractiveness of the food.

PROBLEM 3 *How do grades and brands in foods aid in efficient marketing?*

Consumers today find themselves almost in a maze when they go to the market to purchase foods. Confronted with rows upon rows of canned foods, tray after tray of fresh foods, and with numerous packages of dried and frozen foods, cereals, and condiments, they may feel bewildered when they attempt to make their selections from the vast array. What grade of pineapple should they buy? Should it be broken slices or whole ones? Which of the many brands of beets will best meet their demand for quality? These and many similar questions arise.

Grades

Not so long ago purchasers had no way of knowing whether or not the type of product they paid for and took home was what they desired. No attempt had been made to give them such assurance until the enactment of pure-food legislation, both state and national. The first indications to consumers of the real character of the product that they were buying followed this legislation. Later the government began to establish certain specifications and standards that had to be met in the foods that were purchased for government use. In doing this, grades for foods were



Courtesy of Sunkist Growers

Fig. 91

Grading of oranges.

established. By means of grades, many products have come to be classified and standardized according to size, maturity, color, or other constituents that determine quality. A grade is merely a classification or grouping of units of a product having the same qualities and value. The qualities by which a grade is determined may not be the same for every product. Butter, grains, vegetables, fruits, meats, and condiments are among the foods that have been included in this grading, which has come to be used as a basis of selection by others than the government. Determination of the United States Government Grades for these foods is a responsibility of the Agricultural Marketing Service of the United States Department of Agriculture. Recently, some states have likewise set up standards and grades for certain commodities. Various industries and individual producers have also developed grades for certain products.

Although the grades and standards may vary with the different agencies named, their establishment is an indication, at least, of a tendency toward uniformity. But because there is no one system of grading accepted by these various agencies, considerable confusion results.

The grade terms that are most common in commercial usage are Fancy, Extra Standard or Choice, Standard, and Substandard. Obviously these names are much more confusing and vague in meaning than are the corresponding terms recommended and most used by the United States Department of Agriculture: Grade A, Grade B, Grade C, and Grade D. The general adoption of the letter terminology by the food industries would greatly aid the homemaker and other consumers and would simplify their problems in purchasing food.

The Federal Food, Drug, and Cosmetic Act provides for only limited compulsory grade or quality labeling of foods. Authority is given to promulgate standards of minimum quality and fill of containers of certain specified foods moving in interstate commerce. As soon as a minimum standard is set for a given food, then any market unit of this food that falls below this standard must be labeled as substandard. Standards of this type are in force for a number of foods. In fact, it is possible for a product to be so low in quality that it is ruled off the market. The act has also made possible the development of permissive grades for various food products, especially the processed ones. Already this has been done for many products, and study is being continued for others.

Another important provision of the Food, Drug, and Cosmetic Act offers to food processors a continuous factory inspection and grade labeling of food products by the United States Department of Agriculture. The legend, "Packed under the continuous inspection of the U.S. Department of Agriculture," and the prefix "U.S." may be used with the grade names on the labels when the products are packed under this inspection and grading. A product may be labeled as "Grade A" or "Fancy," "Grade B" or "Extra Standard," or "Grade C" or "Standard" without government inspection. However, it must measure up to the permissive standards set by the government, and if it does not, it may be seized for misbranding under the Food, Drug, and Cosmetic Act. A number of food processors and business firms are availing themselves of this inspection and grade-labeling service, and products are on the market that carry the United States Government legend and grade letters.

The Foods Standards Committee, the members of which are appointed by the Secretary of Agriculture, has charge of fixing the standards of identity and quality. Before each standard is set, the committee holds a

public hearing, at which time manufacturers, consumers, and other interested persons are heard. The facts presented are used in establishing the standards. Obviously, much time is required to complete the task for even one product. The descriptions of quality which have been established are very specific in regard to the standards for the various characteristics, and also give in detail the method of testing to ascertain whether or not a product meets the requirements.

It must be remembered, however, that these regulations apply only to foods sold in the District of Columbia, in interstate commerce, and to United States Government Agencies. There is need for consumers to become more interested and informed in the use of grade standards in buying. Compulsory grade labeling will come for all grades of all products only when there is sufficient demand for it. People in this country became acquainted with compulsory grade labeling in a limited way when it was applied to meat during wartime rationing. However the experience has not as yet increased the demand for the practice to be made permanent and extended to other food products.

The Canadian Government has for some years required grade labeling of all foods sold in Canada and has established specific grades and standards for these. Thus the citizens of Canada have an opportunity to make their food purchases in an intelligent manner.

Grading of food tends to establish and emphasize standards, thereby enabling the purchaser to know more of what he is buying. Grading also facilitates the repeated purchase of the desired quality of food, and makes it easier to get full value for the money spent. No matter what may be the specific grades of any food product, a knowledge of the standards set for that food helps the consumer materially in making his purchase.

Brands

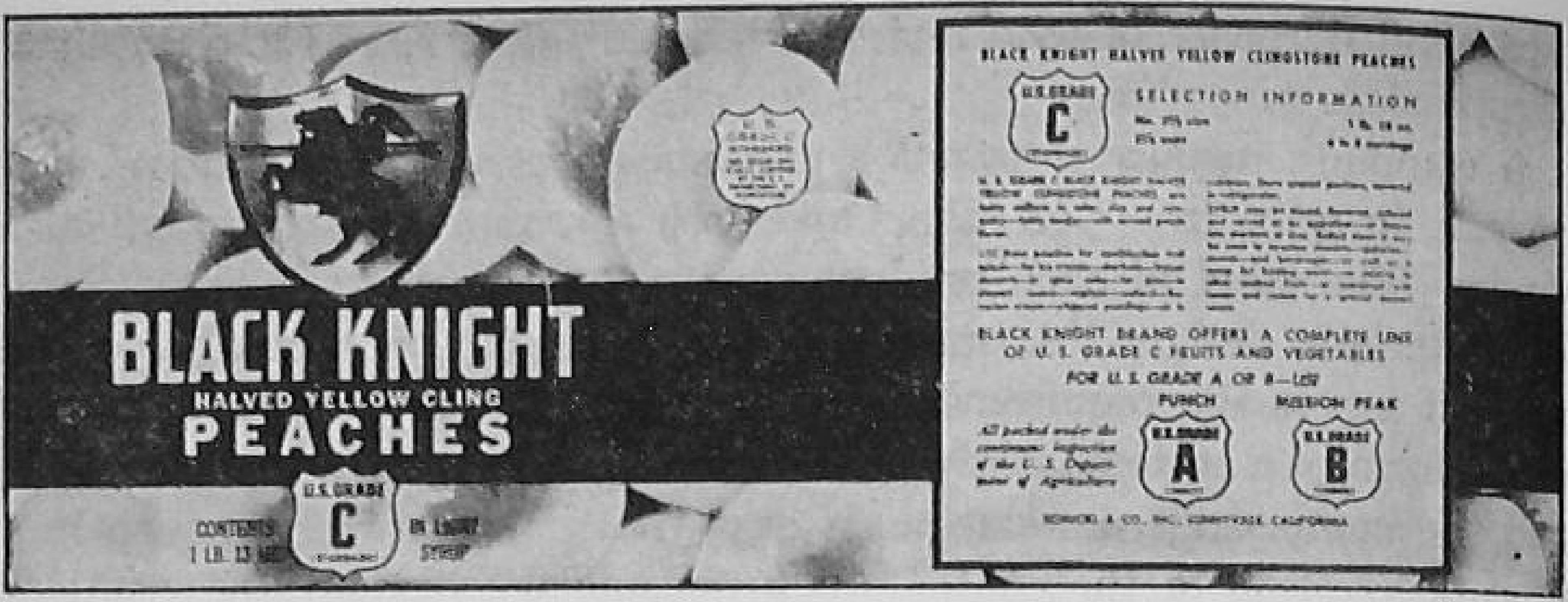
Often better known, and sometimes fallaciously regarded as of equal importance with government grading of food, is the practice by a private organization of labeling food under a trade name or brand. Through his brand names, the producer hopes to establish the commodity as a standard quality and to obtain demands specifically for his product rather than for a certain grade. Most advertising campaigns are centered on brands and rarely mention the grade of the product. Great sums of money are spent annually to boost products through their brand names and to sell consumers the idea of buying entirely by this means. This is equivalent to insisting that the producer should be trusted in all of his claims for the product and that price is a good measure of its value.

The blind purchase of food under advertised brand names is certainly a questionable procedure.

A company usually puts out a number of brands of a product, each varying in price from the others and each also representing a particular grade. The label of each product carries the name of the company, a characteristic design, the brand or trade name, and assurance that the product meets the requirements of the Food, Drug, and Cosmetic Act, in the form of a statement giving the name of the product, its net weight, and the compounds or mixture, if any, that it contains. Frequently a brief description of the contents is given and occasionally the count or measure is indicated. Sometimes a recipe is included. Often the description contains much irrelevant material that offers little information which is really helpful to the person interested in purchasing the product.

The reliability of the brand depends upon the reliability of the packer. Sometimes a brand is widely advertised as a product of exceptional standard and grade when it is in fact mediocre. A company's business life is of course jeopardized by such practices. Reliable producers, distributors, and dealers, realizing the menace of the dissatisfaction thus produced, endeavor to make their brands represent products of a relatively definite standard. The brand protects the producer by indicating the quality of his product. It may explain a difference in price between various products. It may safeguard a producer against unscrupulous competition. This is especially true when standards for a brand are definitely stated on the label.

Some knowledge of trade and brand names is essential in the identification of food products in our present merchandising system. The purchaser needs to be familiar with a number of brands and their qualities and to know relatively which grade a brand represents. The identification of a brand with a grade is sometimes difficult because not all producers have the same standards for grading. By indicating to some extent the quality, the brand helps the buyer to make a more intelligent purchase; but such assistance is obviously inadequate. There is a growing sentiment for supplementing the brand by definite statements about the characteristics and standards of the product. Some firms are using both grade and brand names on their products, and some are also taking advantage of the government's continuous inspection and grade-labeling service. However, consumers must depend upon brand names in making many of their food purchases. Until the standards of brands are known, the supposed advantage of obtaining uniform quality through their use is not assured.



Courtesy of U.S. Inspected Foods Educational Service

Fig. 92

Informative labels give the purchaser the most complete information, as may be noted in the above example. Consumers who make use of this type of labeling of products do much to hasten its widespread adoption.

Labels

Closely related to grades and brands are the labels of products. Great emphasis is being placed upon labels and their use, and the consumer is urged again and again to read the labels when he buys. From these he should be able to obtain needed information about the product he is considering for purchase. The extent to which this is possible depends upon the type of label and upon the use producer and consumer make of it.

Labels may be classified as descriptive, grade, and informative. A descriptive label, as the term indicates, carries a description of the product and may give general information, standardized information, or both. The description may contain few or many facts, and may be helpful or meaningless in helping the customer to evaluate the product or to decide upon its purchase. A grade label bears a grade symbol — letter, word, number, or score — that indicates the rank of the product according to established grade standards. An informative label gives adequate information in simple terms regarding the quality, use, and care of the product, so that the purchaser is enabled to judge the quality or value in terms of his own needs, and to compare this quality and value with other grades of the product and with the same grade of product offered under other brand names. This type of label includes the data given by both grade and descriptive labeling, along with other information that is important to the consumer. Informative labeling is being advocated not only by many consumers but by many producers as well.

The labels on food products are far from perfect, but progress is being

Courtesy of Libby, McNeill & Libby

Fig. 93

The descriptive label may or may not be an effective aid in buying, depending upon the information given, as this label shows.

made in the right direction. Good labels make the marketing of food easier for the consumer, the producer, and the middleman. To encourage the development of the right kind of labeling, consumers must make use of labels and demand informative ones of high quality.

Courtesy o U.S. Inspected Foods Educational Service

Fig. 94

The grade label is just what its name implies. Indicating the grade of a product on the label was one of the first constructive measures in aiding the consumer.

ACTIVITIES

1. Form into groups and hold "buzz" sessions on such questions as:
   (*a*) What foods do you purchase by grade? By brand? Why? Would you do otherwise if you could?
   (*b*) What foods can be purchased by grade in your community? Would you like to see the number increased? What advantages would you take of such increase?
   (*c*) What experiences have you had in buying food by grade? To what extent do these warrant buying by grade?
   (*d*) What satisfactions and difficulties have you had in buying food by brand? Do you prefer this plan? Why?
2. Obtain the brand names used for food products of several packers or jobbers and show how these are related to grades.
3. Classify a number of labels of food products. Evaluate each in terms of its value to a homemaker. Which type of label predominates in the labels being studied.
4. Compare the Food and Drug Act and Regulations of the Canadian Government with our Federal Food, Drug and Cosmetic Act of 1938, relative to the grading and labeling of foods. Which gives the consumer more protection?

PROBLEM 4 *What shall determine the food to be purchased?*

In purchasing food for a family a basic consideration is the food needs of the group. These are determined, first, by the composition of the family, including the number, age, and size of persons comprising it; second, by the activities of the various members of the family as these affect the food needs; and third, the condition of health of the members of the family. It is obvious that the food needs of a group of six adults engaged in sedentary work differ markedly from those of a family made up of a father engaged in outdoor labor, the mother, two sons of high-school age, a ten-year-old daughter, and a two-year-old son. The food needs of any family can be determined with some degree of exactness. They do not vary with differences in incomes, with the type of dwelling, nor with the success of investments. Within certain limits, these needs tend to remain somewhat constant, the changes as a rule being more or less gradual.

Income

The food actually purchased to meet the food needs depends on the income. Families with low incomes have less to spend for food than those with moderate or high incomes. However, families with low incomes spend a larger percentage of their income for food. It is estimated that they may need to spend as much as 50 to 60 per cent of the income for food, and even then the food budget might be much less than that of families of moderate means, spending 25 per cent of the income for food. How the expenditures for food at different levels vary is shown in Table 56.

Further differences in expenditure levels may be explained by the quality of food purchased. The higher qualities cost more per pound or unit but the less waste may result in a less expensive product in the end. Certain foods in a given group cost more than others. For example, cauliflower is more expensive than cabbage, and rib roast more expensive than chuck.

TABLE 56. ADEQUATE FOOD FOR ONE WEEK AT DIFFERENT EXPENDITURE LEVELS FOR A FAMILY OF FOUR, COMPOSED OF MODERATELY ACTIVE PARENTS AND TWO CHILDREN, A BOY EIGHTEEN AND A GIRL FOURTEEN*

Food	Low-Cost Diet	Moderate-Cost Diet	Expensive Diet
Leafy green and yellow vegetables	14 pounds	15 pounds	16 pounds
Citrus fruits and tomatoes	7 pounds	10 pounds	12 pounds
Potatoes and sweet potatoes	13 pounds	12 pounds	10 pounds
Other vegetables and fruits	12 pounds	25 pounds	31 pounds
Milk, cheese, ice cream (one oz. cheese or 2–3 large dips of ice cream equal 1 cup milk)	17–21 quarts	21 quarts	21 quarts
Meat, poultry, fish	9 pounds	12 pounds	16 pounds
Eggs	1½ dozen	2 dozen	2½ dozen
Dried beans and peas, nuts	1½ pounds	1 pound	1 pound
Cereals and cereal products (count 1½ lbs. of "baked foods" as 1 lb. of flour)	18 pounds	13 pounds	8½ pounds
Fats, oils	5 pounds	5 pounds	5 pounds
Sugar, syrup, preserves	4½ pounds	5 pounds	5 pounds
Cocoa	¼ pound	¼ pound	¼ pound
Tea	⅛ pound	⅛ pound	⅛ pound
Coffee	1 pound	1 pound	1 pound

* Adapted from publications of Bureau of Human Nutrition and Home Economics, United States Department of Agriculture.

Space Design for Household Storage, by Helen E. McCullough, Illinois Agricultural Experiment Station.

Fig. 35

Adequate storage space contributes to wise buying.

An important part of the income often is the food produced at home. Studies of farm families in different parts of the United States show that in many instances more than half the total food consumed was produced on the farm. Also, a portion of most of these farm-produced foods was sold. Among the foods most frequently listed as raised both for home consumption and for sale were milk, cream, cheese, poultry, eggs, meat, potatoes, and other vegetables. Many village and town families produce significant amounts of their food, too. In any situation, the kind of food produced at home would obviously affect the dispersion of expenditures among the different items.

Storage space

The kind and amount of storage space are important in determining the amount of different kinds of food to be purchased. Studies show that the majority of homes have too little food-storage space. There is no longer the potato cellar, carefully banked in the back yard. The basement, once an admirable cold-storage place, now houses a furnace and becomes too warm to serve in storing vegetables and fruits. The pantry or buttery with its tiers of shelves has disappeared from the modern house.

The former custom of buying one to three months' supply of staple groceries, vegetables, and fruits has yielded to weekly, bi-weekly, or even daily purchasing. Though the lack of storage space in the home is partially responsible for this shift in buying habits, the improved market, with food of all kinds usually available, is also a factor in the change. With the improved modes of transportation, including automobiles and better roads that shorten the trip to the market from an all-day journey to one of an hour and a half, the need for food-storage space has become less acute for many families. However, even today in towns and communities far inland and away from the railroad, and in ranch country with unimproved roads, homemakers still need to buy foods in quantity and to store them. Hence ample provision for storage must be made in homes so situated. The increased use of frozen foods which require storage in the form of home freezers and large refrigerators with freezer compartments is encouraging quantity buying of these foods by homemakers in all parts of the United States. There is need for a wise balance between the semi-annual buying of pioneer days and the semi-daily shopping of some present-day apartment dwellers. Storage space should be provided that would make possible efficient and economical purchasing of food.

The question of what constitutes adequate food-storage space in the home is not an easy one to answer; for families differ in their needs, practices, and desires. Many homemakers are dissatisfied with the food-storage space in their homes and want more than they have. Families should give more consideration and study to the matter. In any home provision should be made for cool-storage, dry-storage, refrigerator and freezer space and for the storage of other foods not so included. This space should be as adequate for the family's need as is possible.

In many homes the existing food-storage space could be better utilized if a little time and thought were given to the matter. Some improvements might readily be effected with the expenditure of little or no money, as for example: ridding shelves of needless clutter; storing food more efficiently in the available space; and increasing surface storage space by putting new shelves between the present shelves, which are often needlessly so far apart that potential storage space between them is entirely wasted. In any case, food purchasing must be planned in relation to the available storage space.

Prices and price trends

Prices and price trends exert an influence on decisions in the buying of food. In general, lower prices tend to encourage and higher prices tend to discourage the purchase of a food. It is important, then, that essential foods should not be priced too high for the majority of people to purchase. The government has therefore found it necessary at various times to use price controls, price ceilings, and subsidies as means of keeping the prices of various essential foods at reasonable levels. Often larger amounts of a food may be purchased if the price is reduced for a short period than if it remains constant. Sometimes a probable upward trend in the price of a commodity also makes a larger purchase desirable. When there is adequate storage space and the food is one that will keep indefinitely, quantity buying in such circumstances may be wise. The decision in each case should depend upon the kind of food to be purchased as well as upon the general business and home conditions existing at the time.

Government regulation and limitation of the amount of a given food or foods that a person or family may purchase are sometimes necessary. While such rulings are in force, regardless of the price, these exert an important influence on food buying by individuals and families.

Keeping quality of food

The tendency of food to keep or to spoil should be considered in the

light of the storage facilities and the probable rapidity of consumption by the family. Loss through spoilage may offset any advantage of large quantity purchasing.

The season influences the quantity of certain foods that may be advantageously purchased. Cornmeal has low keeping qualities in warm weather, so during the summer months it should be bought in relatively small amounts. Potatoes and apples may be purchased in larger quantities in the winter than in the summer. Dried beans are of better quality in the fall than in early spring and summer.

Menus

Menus may be regarded as plans to meet the food needs of the body by providing for specific foods to be served at definite times. They list the kinds of foods to be used and so form the basis for determining the purchases to be made. Menus should be planned for the week, and the market order made up from them. In preparing menus, the food already on hand should be considered, as well as the foods available on the market, the current prices, the needs and likes of the family, and the ease of preparation. By careful checking of the recipes to be used and the number of persons to be served, the homemaker can determine the amount of food needed.

For a family of four — father, mother, boy of twelve, and girl of fourteen — the following meal plan for three days would require the approximate amounts of food listed on page 000.

Menus

First Day

Breakfast

Orange
Rolled Oats, Sugar, and Milk
Bacon Eggs
Bread Butter
Coffee or Milk

Luncheon

Tomato Bouillon and Crackers
Cheese Soufflé Lettuce, Radish and Cucumber Salad
Bread Butter Plum Jelly
Apricot Upside Down Cake and Milk

Dinner

Meat Loaf and Brown Gravy
Baked Potato Creamed Cabbage
Fruit Salad
Bread Butter
Baked Apple and Milk Sponge Cake
Coffee, Tea, or Milk

Second Day

Breakfast

Grapefruit (one half)
Grapenuts, Sugar, and Milk
Creamed Dried Beef on Toast
Coffee or Milk

Luncheon

Scalloped Eggs
Pineapple, Pepper, and Cabbage Salad
Hot Biscuits Butter Grape Jam
Sponge Cake and Lemon Sauce

Dinner

Pot Roast and Gravy
Mashed Potatoes Buttered Spinach
Celery, Apple, and Nut Salad
Bread Butter
Cherry Jelly and Whipped Cream
Coffee, Tea, or Milk

Third Day

Breakfast

Stewed Prunes
Rolled Oats, Sugar, and Milk
Scrambled Eggs and Bacon
Bread Butter
Coffee or Milk

Luncheon

Baked Hash
Brown Sweet Potatoes
Tomato, Cabbage, and Pepper Salad
Bread Butter Honey
Canned Peaches Vanilla Wafers

Dinner

Fried Liver and Milk Gravy
Baked Squash Creamed Celery and Carrots
Head Lettuce Salad
Bread Butter
Apple Pie
Coffee, Tea, or Milk

Approximate Amount of Food Required for These Menus

4 oranges
2 grapefruit
4 lemons
1 lb. muscat grapes
½ pk. apples
1 lb. prunes
1 can, No. 2½, pineapple (broken slices)
1 can, No. 2½, peaches
1 can, No. 2½, apricots
1 can, No. 2, tomato juice
¼ medium package rolled oats
¼ package grapenuts
3–4 loaves bread
1 lb. crackers
¼ lb. vanilla wafers
3 lbs. flour
2 heads lettuce
3 tomatoes
6–8 lbs. potatoes
2 lbs. sweet potatoes
1 large or 2 small heads cabbage
1 green pepper
1 bunch radishes
1 cucumber, medium
2 lbs. spinach
1 bunch celery
2 lbs. squash
1 bunch carrots
¼–⅓ lb. cheese
2 doz. eggs
9 quarts milk
½ lb. bacon
1–2 lbs. meat prepared for loaf
3–4 lbs. beef rump
¼–⅓ lb. dried beef
1–1½ lbs. liver
small sack peanuts
2 lbs. lard
1 lb. butter or margarine
1–1½ pt. cream
¼–⅓ lb. coffee
1 oz. tea
1 oz. cocoa
3 lbs. sugar
1 box gelatin, cherry
bouillon cubes or extract
1 lb. honey
1 glass plum jelly
1 glass grape jam
½ pt. vinegar

Other groceries needed in small amounts: salt, pepper, mustard, paprika, and baking powder.

In buying the food for these menus, the more staple foods that are used often in the preparation of all meals should be purchased in larger quantities than are required merely for this three-day plan. Examples of such foods are flour, coffee, cocoa, and vinegar. It is relatively much more expensive to make frequent purchases of staples in small lots than to stock them in quantity.

The following suggestions will be found helpful by those responsible for the purchasing of food for a family or other group:

1. Plan menus one week in advance.
2. When planning the menus
   (*a*) make list of foods and amounts needed;
   (*b*) provide for utilization of left-overs.
3. Make plans flexible enough to take advantage of special sales.
4. Plan and buy, at one time, food for no less than one day's meals.
5. Use foods that are in season.
6. Know the quantity and quality required.
7. Purchase by grade whenever possible.
8. Determine the price before buying.
9. Purchase by weight whenever possible.
10. Observe the scales during weighing and frequently check weights at home.
11. Be familiar with labels and the information given upon them.
12. Check order when delivered and put it away carefully.

Knowing the number of servings yielded from a specific unit measure of each of the foods included in a menu aids greatly in making out a market order. It is then possible to purchase the correct amount of food needed and thus be assured of plenty of food for the meal and also of no unnecessary food waste. Frozen foods have the approximate number of servings indicated on the package as do many other packaged foods. Many canned foods, too, have this information on the labels. A purchasing guide that includes this information for a number of other commonly served foods is given in Table 57. By adding other foods to this list, from time to time, as she obtains the necessary information, the homemaker can build up a rather comprehensive and complete buying guide to which she can refer as the need arises.

TABLE 57. GUIDE FOR PURCHASING FOODS

Food	Unit Measure	Number of Servings
Bread	1 lb. loaf	19 slices
Butter or margarine	1 lb. (2 cups)	48 pats
Cheese		
American or brick	1 lb. (2⅔ cups, cubed, or 4 cups, grated)	14–16 slices
Cottage	1 lb.	4–6
Chocolate	1 lb. (16 squares)	60
Cocoa	1 lb. (4 cups)	100
Coffee	1 lb. (5 cups)	50
Crackers	1 lb. (small, square)	108 crackers
Farina and other granular cereals	1 lb. (3 cups)	25
Fruits		
Apples	1 lb.	3–4
Apricots		
Fresh	1 lb.	4–6
Dried	1 lb.	6
Bananas	1 lb.	3
Berries	1 qt.	4–6
Cherries	1 qt. (2 cups, pitted)	4–5
Grapefruit	1	2
Grapes	1 lb.	4
Lemons	1 doz.	1 pint, juice
Oranges	1 doz.	1 quart, juice
Peaches		
Fresh	1 lb.	4
Dried	1 lb. (3 cups)	12
Pears	1 lb.	4
Pineapple	2 lbs.	6
Prunes (dried)	1 lb. (2½ cups)	8
Rhubarb	1 lb. (4–8 stalks)	4–5
Gelatin		
Flavored	3 oz. pkg. (1 pint jelly)	4–6
Unflavored	¼ oz. pkg. (1 pint jelly)	4–6
Ice cream	1 quart	6–8
Macaroni, spaghetti, or noodles	1 lb.	12
Marshmallows	1 lb.	60–80 marshmallows
Milk		
Dried whole	1 lb.	Equals 3½ quarts milk
Evaporated	1 can (14½ oz.)	Equals 3½ cups milk
Liquid	1 quart	4 cups
Meat		
Boned, ground, or no bone	1 lb.	4–5
Large amount of bone	1 lb.	1–2
Medium amount of bone	1 lb.	2–3

TABLE 57. GUIDE FOR PURCHASING FOODS (continued)

Food	Unit Measure	Number of Servings
Oats, rolled	1 lb. (5 cups)	12–13
Rice	1 lb. (2¼ cups)	12–14
Tea	1 lb. (6–8 cups)	300
Vegetables (dried)		
Beans		
Kidney	1 lb. (2⅓ cups)	12
Lima	1 lb. (2⅓–3 cups)	10
Navy	1 lb. (2–2½ cups)	10
Peas, split	1 lb. (2 cups)	10
Vegetables (fresh)		
Asparagus	1 lb. (16–20 stalks)	4
Beans		
Lima (in pod)	1 lb. (⅔ cup, shelled)	2
Lima (shelled)	1 lb. (2 cups, shelled)	6
String or snap	1 lb. (3 cups)	5–6
Beets	1 lb. (3–4 beets)	3–4
Broccoli	1 lb.	3–4
Brussels sprouts	1 lb.	4–5
Cabbage		
Raw	1 lb. (½ small head or 4 cups, shredded)	7–8
Cooked	1 lb.	4–5
Carrots	1 lb.	5
Cauliflower	1 lb. (1 small head)	2–3
Celery	1 lb.	3–4
Corn		
Cut	1 lb. (2 cups cut)	4
Ears	5 medium	5
Eggplant	1 lb.	4–5
Greens	1 lb.	4
Mushrooms	1 lb.	6
Onions	1 lb. (3 large)	4
Parsnips	1 lb.	4
Peas (in pod)	1 lb. (1 cup, shelled)	2
Potato		
Sweet	1 lb. (3 medium)	3
White	1 lb. (3 medium)	3
Rutabaga	1 lb.	4
Squash		
Hubbard	1 lb.	2
Summer	1 lb.	3
Zucchini	1 lb.	3–4
Tomato	1 lb. (4 small)	3 cooked or 4 raw
Turnips	1 lb. (3 medium)	4

ACTIVITIES

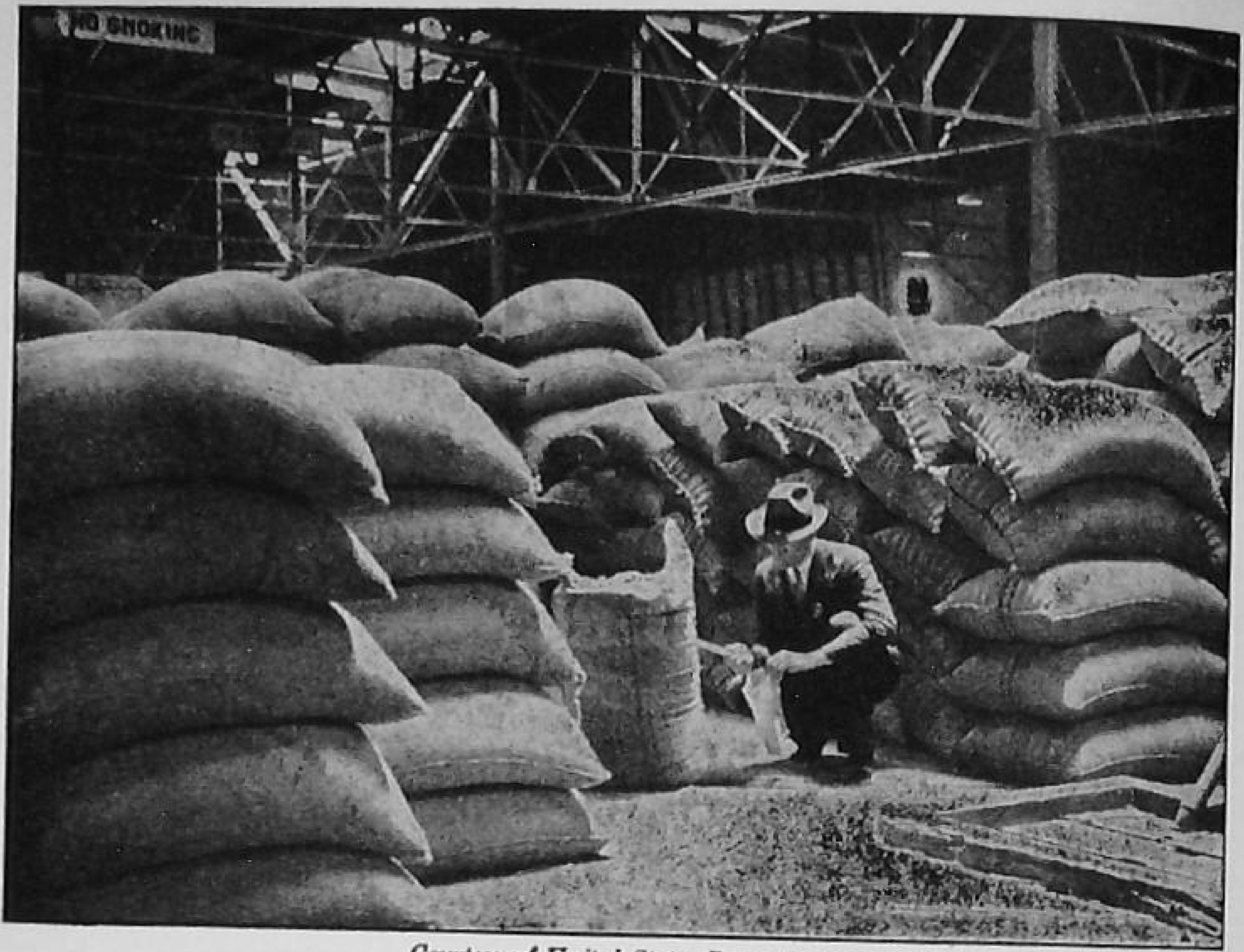
1. Form into groups and each group plan one week's menus for four young women living in a four-room apartment and doing their own housekeeping, according to one of the following patterns:
   (*a*) Low-cost good diets.
   (*b*) Moderate-cost good diets.
   (*c*) Expensive good diets.
   Each group make out the market order and estimate the cost for the week's food purchase according to the menus planned. Class compare the menus in respect to foods used, adequacy, cost, palatability and attractiveness.
2. Form into groups and each group plan the menus for one week for a family of five (father, mother, son aged 16, daughter aged 12 and son aged 6) with a given income. Estimate the food needed and the cost. What per cent of the income is required to furnish the family with adequate food? What practices should this family follow to keep food expenditures at a minimum and still have an adequate diet?
3. Class plan the food storage space and facilities that the above two groups would need for adequate storage of their food.
4. Decide what is needed in storage space and facilities in your own home. Compare your list with the lists of other class members. What are the most common needs for storage evidenced in the lists?
5. Estimate the cost of the week's food for:
   (*a*) Each level of expenditure, Table 56. How do the costs compare?
   (*b*) The cost of the market order on page 429. What will the meals cost per person per day?

PROBLEM 5 *How shall coffee, tea, cocoa, and chocolate be purchased?*

Coffee, tea, cocoa, and chocolate are frequently and extensively bought by families and persons throughout the United States. So widely are these products used that they may be regarded almost as "must have's" in a large portion of the food purchases made in this country. Interesting, too, is the fact that all come from other lands, none being produced here.

Coffee

The supply of coffee in the United States comes chiefly from Brazil, though other tropical countries supply a minor part. There are many



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 96

Coffee offered for import into the United States must be sampled. This is to assure its meeting certain required standards.

kinds of coffee on the market, each with a characteristic flavor. The general division of the common varieties separates the yield into the Brazil coffees, including the Santos and the Rio coffees, and the mild coffee, including among others the Java, Mocha, Bogata, and Puerto Rican coffees.

Almost no variety of coffee comes on the retail market without being mixed with coffee of other varieties to produce a desired blend of flavor, color, and body. Usually small amounts of the mild coffee are added to larger amounts of the Brazil coffee in the process of blending. Coffee retailers have found it desirable to meet the various tastes and purses of their public by offering several blends, which are indicated by brand names. Aside from the distinction made in label and in price between extremes of the superior grains on the one hand and the broken, less clean grains on the other, there are no established grades for coffee as there are for some other products. Therefore the area between the superior and the extremely poor is not well charted. However, the Food, Drug, and

Cosmetic Act requires such exact statements concerning types of coffee used, coloring matter, and other adulterants added, that a certain protection is afforded.

The selection of coffee is largely a matter of choosing the blend most pleasing to the taste and then continuing its use. Price is not always an authoritative guide to a desirable blend; individual taste is more often the ultimate determinant.

Also to be considered in buying coffee is the grind. Only in making "boiled" coffee should a coarse grind be used. Drip or filtered coffee requires a fine grind; percolated coffee, a fine or medium grind. Coffee is best when freshly roasted and ground. When exposed to the air it loses its flavor. For this reason the one-pound package is the best size to purchase. Most families will use this quantity up within a week and there will be no noticeable staling. Vacuum-sealed metal cans and glass jars provide the best type of packaging. Coffee is sometimes packaged in paper bags. If so, these should be of specially treated paper with liners of foil or other material that will help prevent rapid deterioration of the coffee.

The choice between a cheap grade of coffee and a better one should be based not only on the money expenditure but also on the amount of beverage that can be made from each. Sometimes, when considered on this basis, the supposedly cheap coffee proves to be more costly. The grind has something to do with the amount of coffee obtained. Fine grinds yield more than coarse ones. On the other hand, the finer the grind the quicker the staling.

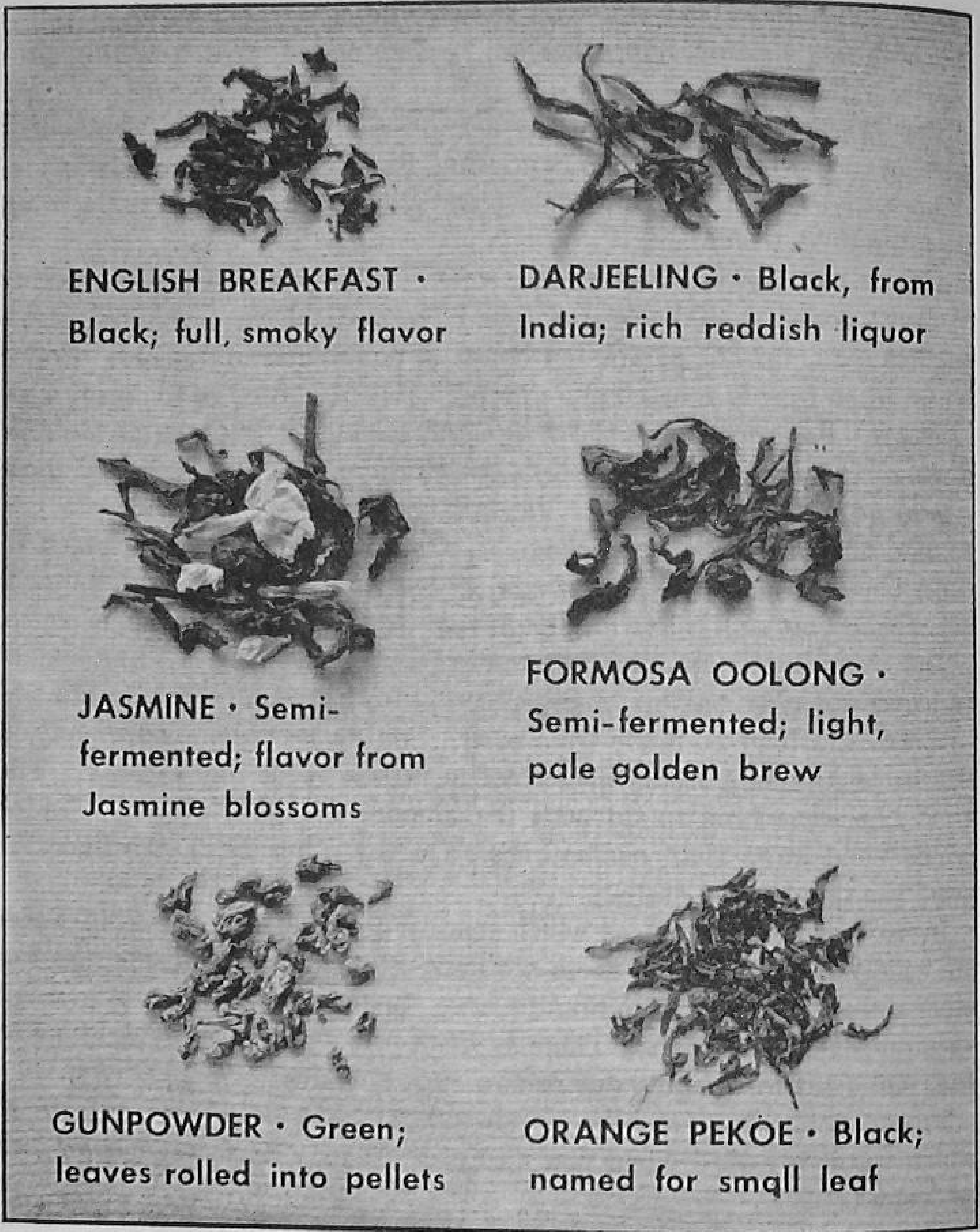
Instant or soluble coffees which readily dissolve in hot or cold water are widely used. Most of these are pure coffee and of the same blend as other coffees with the same brand name. Instant coffees are sold in small vacuum-sealed glass jars. There is some packaging in individual coffee bags sufficient for making one or two cups of coffee.

Frozen coffee may also be purchased. It is a liquid concentrate to which water is added when ready to use. It may be served hot or iced as desired.

Decaffeinized coffee is available and in more than one grind. It is packaged in one-pound vacuum sealed tin cans and is more expensive than other coffee. Instant decaffeinized coffee may also be purchased. Those who are sensitive to caffein find these coffees especially desirable.

Tea

Most of the tea used in the United States comes from India, Ceylon, Japan, and China. The Federal Government requires that all tea shipped



Courtesy of Sunset Magazine

Fig. 97

Grades of tea have been established which makes it easy for the consumer to suit his particular preference.

into this country shall meet definite minimum standards for wholesomeness, purity, and quality. Tea which does not meet these standards is either destroyed at the importer's expense or sent out of the country. Beyond this minimum quality requirement, there are no further grade standards for tea.

The Federal standards, set by a board of tea experts and arrived at by taste, smell, touch, and various scientific tests, are now in effect for the following types of tea:

China Gunpowder, for all green (unfermented) teas.
Canton Oolong, for all oolong (semifermented) teas.
China Congou, for black (fermented) teas of similar type.
Java, for black (fermented) teas of the East India type.
Scented Canton, for all scented or flower teas.

After the consumer has determined his preference for a kind of tea — that is, for either green (the unfermented), oolong (the semi-fermented), or black (the fermented) — there remains a choice as to the country

Courtesy of Sunset Magazine

Fig. 98

Instant tea, even more modern than tea bags, shares in making quick work of brewing a cup of tea.

Table 58. TEA CHART FOR VARIOUS KINDS OF GREEN, SEMI-FERMENTED, AND BLACK TEAS *

Tea	Country	Trade and Grade Terms (The trade grade terms are descriptive of the size of leaf and do not refer to the flavor or quality)
Green tea (unfermented) It produces a bright, clear, greenish liquid, well flavored and fragrant.	China. The green tea produced in China is regarded by the Chinese as superior to green teas from other countries.	1. Gunpowder 2. Imperial 3. Young Hyson 1st 2d 3d, etc.
It produces a thin, delicate liquid, flavory and fragrant, but not as heavy in cup as China green.	Japan. A good quality is produced in Japan. Preference, as indicated by the volume exported to United States, is generally for Japan green rather than for China green.	1. Basket-fired (by hand) 2. Pan-fired (by machinery) 3. Nibs (poorer quality leaves)
Oolong tea (semi-fermented) The finest grades produce a liquor with intense pungency and a piquancy with a delicate flavor.	Formosa. This tea is considered by some the best of flavoring teas.	Main grades 1. Fancy 2. Choice 3. Fine 4. Superior 5. Common
Black tea (fermented) The higher grades produce a rich, full flavor and a ruddy colored liquid.	Ceylon. This tea is considered by many the ideal balance between India and such teas as Java and Sumatra and China Black.	1. Broken Orange Pekoe 2. Broken Pekoe 3. Flowery Orange Pekoe 4. Flowery Pekoe 5. Orange Pekoe 6. Pekoe 7. Souchong
China tea is not so strong as India tea. It has a distinct flavor due to difference in soil and climate.	China North South	Congou, often called "English Breakfast," is a blend of all grades. Keemuns and Ningchous from North China. Paklums from South China.
India tea produces a strong liquid of deep flavor and amber color.	India	Leaf grade terms same as in Ceylon.
These teas have an intense pungency with a delicate flavor.	Southern India Nilgiri Teas	Same as Ceylon.
These are strongish teas lacking a delicate flavor in the majority of instances.	Java Sumatra	Same as Ceylon.

* Adapted from data supplied by Thomas J. Lipton, Inc., and Standard Brands, Inc.

from which it comes, and a selection of the grade among the various ones produced in that country. Table 58 indicates the contribution which various countries make to our tea supply.

As with coffee, considerable blending within each type is done in this country. Tea deteriorates with age; hence its packaging is most important. Tea is generally found on the market in airtight screw-top canisters, in aluminum foil packages, or in tin boxes. All well-known packaged black teas are blends combined for flavor. Green packet teas are generally not blended. Some blending of black and green teas is done, but the demand for this kind of blend is small in this country. Packaged tea carries a label that gives the purchaser needed information regarding variety, kind, blend, and grade.

Tea may be purchased in individual tea bags, usually made of paper, all ready for the brewing. The convenience of these bags and the clearness and pleasing flavor of the beverage thus made appeals to consumers. Hence tea in this form is being increasingly used.

Instant or soluble tea is available in some localities but as yet its use is extremely limited. Tea flavored with orange and spice may be purchased in many places. It is often used for special social events as receptions and teas. It is much more expensive than other tea but it makes a delicious and refreshing beverage.

Chocolate and cocoa

Chocolate and cocoa are on the market in a number of forms. Familiar to all are bitter chocolate, sweet chocolate, powdered chocolate, breakfast cocoa, cocoa processed with alkali, sweetened cocoa, and sweet milk cocoa. Bitter chocolate and breakfast cocoa are most used for cooking purposes, and sweet chocolate, especially that which is known as milk chocolate, for eating. Cocoa is cheaper than chocolate because of its lower fat content. It is much used in cookery because it is convenient both to use and to store. Cocoa keeps better in warm weather than does chocolate. Chocolate and cocoa are usually bought packaged and by brand. A wide variation in price may indicate a wide variation in quality. A good grade of cocoa is a rich reddish-brown in color, and free from grit and other fillers. Sweetened chocolate and cocoa are more economically purchased in relatively large quantities than in small. Instant chocolate and cocoa though found in some markets have, so far, not been used extensively.

The definitions and standards of identity of the Federal Food and Drug

Administration for chocolate and cocoa include the following characteristics:

Chocolate contains not less than 50 per cent of cocoa fat.
Cocoa, or medium-fat cocoa, contains from 10 to 22 per cent of cocoa fat.
Breakfast cocoa, or high-fat cocoa, contains at least 22 per cent of cocoa fat.
Low-fat cocoa contains less than 10 per cent of fat

Cocoa processed with an alkali must be so labeled. In doing this the general term "alkali" or the specific common name of the alkali ingredient may be used. This method of preparation modifies both the color and flavor of the cocoa, and also tends to yield a beverage that forms a better suspension than other cocoas and leaves less "dregs" in the bottom of the utensil or cup.

It is well to keep these standards in mind when buying chocolate and cocoa in any form, and to read the labels on the packages for indication of type of product and ingredients used. Brand names, too, are important in the case of these products, as certain ones have long stood for high quality chocolate and cocoa in all forms.

ACTIVITIES

1. Compare the labels of different brands of coffee and tea, noting:
   (*a*) The information given.
   (*b*) The extent to which reasons for differences in price are evidenced.
   (*c*) What would influence you most in deciding which product to purchase.
2. Class formulate a set of rules for purchasing and storing coffee and tea in the home.
3. Form into groups and each group prepare:
   (*a*) Beverages from different brands of coffee, tea, chocolate and cocoa. Compare the products in appearance, flavor, amounts used and cost.
   (*b*) Beverages from the different forms of coffee, tea, chocolate and cocoa. Compare the products in appearance, flavor and cost.

PROBLEM 6 *How shall cereals and cereal products be purchased?*

Because cereals and cereal products are inexpensive, they comprise a relatively large amount of the food purchased by a family that wishes to economize. Those most commonly bought are flour, cornmeal, breakfast cereals in some form, rice, cornstarch, prepared mixes, and bread and

other bakery products, including ready-to-bake ones. Most of these are packaged which makes them more sanitary and attractive. Of the cereal foods, grading has been done only for flour and polished rice.

Flour

The most widely used flours in the United States are those made from wheat and include both white and whole-wheat flours. The types of white flour are usually listed as bread, pastry, cake and all-purpose or family flour. However the last two flours have the greatest home use and often are the only ones found in retail markets. These terms refer to the type and not to the grade of the product. Each kind of white flour is best suited for a particular purpose and should be purchased with its use in mind. Though there are a number of grades of flour, not more than two are available in most retail markets — Patent and Straight. Many carry only one grade. Flour is usually sold under its brand or trade name. Each company names its different grades, and to the person familiar with the nomenclature of the company, the brand designates a definite grade or quality of flour. Sometimes the kind of flour and grade are stated on the label. Once a brand has been found satisfactory in use, continuance of the purchase of this particular brand of flour will probably increase standardization of the home-cooked foods made from it. Of course, enriched flours are the best to buy. Any flour so labeled must carry a statement of the exact amount of each vitamin, mineral and / or other food constituents added. In some states only enriched flours may be sold.

Regardless of the type of flour purchased, as good a grade should be obtained as the food budget will allow. Flour is usually marketed in sacks, bags or packages with the brand or trade name and sometimes the grade indicated, in quantities of 100, 50, 25, 5, and 2 pounds. The amount purchased depends upon the amount required by the consumer, the storage space, and the keeping qualities of the flour.

Whole-wheat flour is much used, but its keeping quality is such that it is usually purchased in small quantities. The price is slightly higher than that of patent flour, partly because whole-wheat flour does not keep well and partly because there is a relatively smaller demand for it. Self-rising flours and prepared mixes are being increasingly used. Mixes are available for biscuits, cakes, cookies, muffins, pancakes, pastry, waffles, rolls, and other products, including frostings and icings. Self-rising flours and mixes offer advantages such as thorough pre-mixing of the ingredients, quick preparation, and less variation in the product. Some contain dried egg and / or milk; others require the addition of one or both of these in-

Courtesy of The Kroger Food Foundation

Fig. 99

Cereals and cereal products are important items in the market list.

gredients. Experience and the information on the labels are the best guides in purchasing these flours and mixes. Labels must list the ingredients and the directions indicate what must be added. The latter are of importance in determining the cost and convenience of the product. Only a tightly packaged mix should ever be purchased. In buying any of these products one should note whether the increased price paid for them is justified by the time saved, the convenience in use, and the quality of the finished product.

Cornmeal

Cornmeal, because of its poor keeping qualities, is generally purchased in smaller quantities than is flour. However, there are exceptions to this rule. In certain localities cornmeal has a wider use than does flour. The choice between white and yellow meal remains largely a matter of personal preference, not yet much influenced by the higher nutritive value of the yellow. The "new process" cornmeal has better keeping qualities because the germ and more of the bran are removed. The improvement in keeping quality is thus obtained only by lowering the food value. The most common market units of cornmeal are nine- and five-pound sacks and one-pound sacks or boxes. Meal, too, is marketed by brand or trade name, though less attention is given to this than to the color and the process of its manufacture. Enriched cornmeal is sold in some localities.

Breakfast cereals, rice, and cornstarch

Breakfast cereals, rice, and cornstarch come in packages. Most of these are trade-marked products, each bearing a brand name and a descriptive label that gives a variety of facts about the contents. The wide array of breakfast cereals are often classed as those that are to be cooked and those that are ready to eat. Cereals that require the longest cooking time are the least expensive. Ready-to-eat cereals in individual packages are the most expensive. Whole grain and enriched products are nutritionally the best buys. Rice is purchased in package form; polished rice, both enriched and non-enriched, and brown rice are available. Much of the rice in the grocery stores and markets has been precooked as have many of the breakfast cereals. In this way the cooking time has been greatly lessened. Sometimes the grade of rice is indicated on the package. The grades are based on the number of whole kernels, color, cleanness, and freedom from mixture with other varieties. These are Extra Fancy (U.S. No. 1), Fancy (U.S. No. 2), Extra Choice (U.S. No. 3), Choice (U.S. No. 4), Medium (U.S. No. 5), or Sample grade. Cornstarch is purchased in the package and by brand and label. Cereal foods, as well as flours and meals, should as a rule be purchased in as large a quantity as can be easily stored and satisfactorily used. These foods should be free from dirt, mold, mustiness, and weevil at both the time of purchase and that of use.

Bread and other bakery products

Bread, when purchased, should be of good quality and wrapped in a sanitary package. If white bread, it should be "enriched" and the fact so indicated on the wrapper. Good white bread has a yellow-brown crust, a fine and even texture, and a good flavor and odor. It is creamy white in color and elastic to the touch. Good whole-wheat bread has much the same qualities, except it is brown in color and coarse in texture. If there is ready access to a market, it is probably best to buy not more than two days' supply of bread at a time. Some consumers prefer fresh bread daily. Bread deteriorates rather rapidly in quality; hence the purchase of too large an amount may result in waste or the use of the food in an undesirable condition. To retard or prevent deterioration, many bakers are using sodium or calcium propionate in their bread to give baked-in resistance to mold and rope, common types of bread spoilage. The ingredient so used is then indicated on the wrapper. The home freezer or freezing compartment of the refrigerator is a good storage place for bread.

Among the other most commonly bought bakery products are cakes,

Courtesy of The Kroger Food Foundation

Fig. 100

Bakery products like these are hard to resist.

cookies, doughnuts, pies, and rolls. Only a good quality of these products is ever satisfactory. Bakery foods should be bought in packaged form. Each product should be completely packaged, and the wrappings should be such that the purchaser can readily see the contents. Choice of bakery products soon comes to be made on the basis of previous experiences. A family may like a certain bakery's bread, another's cakes, and still another's doughnuts; or the group may prefer to obtain all these foods from only one producer.

Ready-to-bake products are finding increasing use and include cakes, cookies, cake batter, pie crust, pies, biscuits, rolls, griddle cakes and waffles. These are of three types: "Brown'n Serve," frozen, and refrigerated. "Brown'n Serve" goods are mainly breads, rolls and pastries which are baked at low temperatures leaving browning to be done just before serving. Frozen products are prepared for the oven, frozen solid, and kept under freezing conditions until ready to be baked in the home. Refrigerated ones are prepared for the oven, packaged, and kept under refrigeration until ready for baking. A date limit should be on the package of the ready-to-bake preparation, in order to assure the purchaser that it has not been held too long. A statement of the ingredients and directions for use should also be included. The recipe, the ingredients, and the care with which the directions are followed largely determine the flavor

and quality of these products. Here, too, the homemaker's experience with the product is important in determining the extent to which she purchases and uses it.

The United States Government requires that the following information be given on all baked foods shipped in interstate commerce; and all bakery products, including the ready-to-bake varieties, should give these facts on their labels:

1. Name and address of distributor, manufacturer, or packer.
2. Common name of the product.
3. Net weight.
4. List of ingredients used, preferably in the order of predominance.
5. Declaration of artificial coloring, flavoring, and chemical preservative, if used.
6. The common or usual names of specific vitamins and minerals added, if an enriched product.

Only a sanitary bakery or market should be patronized for baked foods. Most of these foods are more expensive when obtained from a bakery than when prepared at home. The consumer must decide whether the added cost of these ready-made products is outweighed by their advantages.

ACTIVITIES

1. Compare the cost and quality of a given product made at home from individual ingredients with the same product (a) made from a prepared mix, (b) purchased at a bakery, (c) purchased in ready-to-bake or ready-to-brown form.
2. Estimate the differences in cost and quality of a given product made from all-purpose flour and from self-rising flour.
3. Compare the prices:
   (*a*) Of servings of uncooked and partially cooked cereals with ready-to-eat cereals.
   (*b*) Of family size packages of ready-to-eat cereals and individual-size packages of the same cereals in terms of servings.
4. Find out your state regulations in regard to the merchandising of bakery products. How adequate are these?
5. Plan the storage space needed for cereals and cereal products in your home. Recommend the quantity of each that should be purchased at one time by your family.

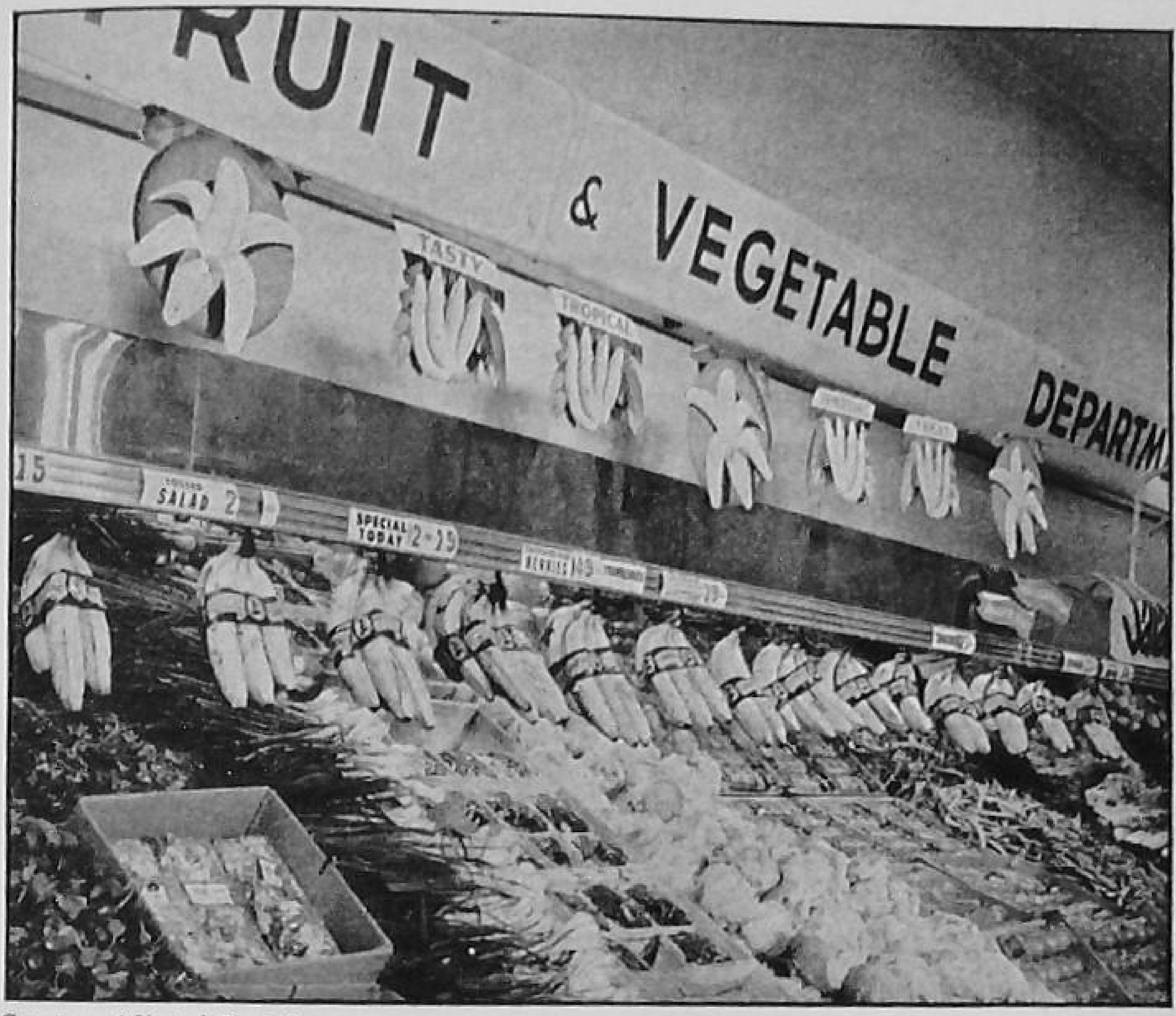
PROBLEM 7 *How shall fresh fruits and vegetables be purchased?*

As a result of the increased popularity of fresh fruits and vegetables, a wide variety of these foods is now available on the market at all times of the year. It is possible in an Atlantic seaboard city to have served at one meal a salad which contains grapefruit from Florida, bananas from Central America, grapes from California, lettuce from Arizona, and celery from Michigan. The production and distribution of fresh fruits and vegetables comprise one of the large-scale commercial enterprises of the world.

Because fruits and vegetables are widely used and are universally needed in the daily diet, their purchase is an important responsibility. The limitations of the food budget, the tastes of the family, and the price and seasonability of the product all influence the choice among foods within this group. After a certain food has been decided upon, a selection must be made among the various qualities or grades available. Information concerning the characteristics of the grades of a fruit or vegetable help the buyer to make a wise selection.

Grades

The United States Government has determined grades and specifications for most of the fresh fruits and vegetables on the market. Many states have made the use of grades compulsory. State grades sometimes differ from United States grades, though in most instances they are the same. In general, United States grades for fresh fruits and vegetables are known as U.S. Fancy, U.S. No. 1, U.S. No. 2, U.S. Commercial, U.S. Combination, and Unclassified, though for some products there are more grades and for others fewer. The less perishable fruits and vegetables have the greater number of grades. Some foods, such as mushrooms and sweet cherries, have only two grades: U.S. No. 1, and Unclassified; others, such as potatoes, may have as many as six or even more. Most foods have at least three or four grades. The basis of grading in both fruits and vegetables is size, color, stage of ripening, maturity, cleanliness, trueness to name, and freedom from disease and insect injury.



Courtesy of United Fruit Company

Fig. 101

A tempting display of seasonable foods.

Many of the fresh fruits and vegetables on the retail market do not have their grade indicated in any specific manner, but if the purchaser is familiar with the important qualities or characteristics of some of the grades, he will be able to make an intelligent decision more readily than if uninformed. His request for these foods by grades may lead to their sale on such basis. Such foods as citrus fruits, potatoes, apples, and tomatoes can always be purchased by indicated grade. Imported fresh fruits and vegetables carry the name of the country where grown.

Information concerning the grades and desirable qualities of some of the commonly used fresh fruits and vegetables follows.

Fresh Fruits

Apples. Apples have seven grades, besides three combination grades. These are based upon size, condition, color, and maturity. Apples are

not graded by the same standard throughout the country. There are both federal and state grades for them. Some growers use one system; some, the other. The grade as well as the variety is indicated on the container. Each variety has its characteristics and uses. Apples should be fully matured, with bright skin and fairly firm flesh.

When packed in boxes, apples are graded also as to the number in the box. The most common ones are 88, 104, 113, 125, 138 and 150, the number varying with the size. The leading varieties of apples, their uses, and their availability in the market are shown in Table 59.

Apricots. Apricots should not be soft, overripe, or shriveled, but should be well formed and should have reached the proper stage of maturity to insure the completion of the ripening process. They should be free from decay, mold, cuts, and other damage, and should be of medium to large size. The color should be a strong orange or a golden yellow. They are in season in June, July, and August.

Avocados. Avocados are most plentiful in the fall and winter. Those

TABLE 59. APPLES: WHEN AND HOW TO USE THEM

Always use apples in proper season, for only then are they at their best. As different varieties have widely different uses, select proper variety for each purpose. The following list will serve as a guide.

Variety	Eating	Baking	Pies	Salad	Sauce	Season
Yellow Transparent	Fair	Fair	Good	Fair	Excellent	July–August
Gravenstein	Good	Fair	Fair	Good	Good	July–Sept.
Dutchess	Fair	Fair	Good	Fair	Good	July to Sept.
Maiden Blush	Fair	Fair	Fair	Fair	Excellent	August–Sept.
Wealthy	Fair	Fair	Good	Fair	Good	August to Nov.
McIntosh	Excellent	Good	Good	Good	Excellent	Sept. to March
Cortland	Good	Good	Good	Good	Excellent	Sept. to Dec.
Grimes Golden	Excellent	Fair	Good	Good	Excellent	Sept. to Dec.
Jonathan	Excellent	Excellent	Excellent	Good	Good	Sept. to Jan.
Northern Spy	Good	Good	Excellent	Good	Excellent	Sept. to Dec.
Greening	Fair	Good	Good	Fair	Good	Oct. to Jan.
Red Delicious	Excellent	Fair	Fair	Excellent	Good	Oct. to March
Golden Delicious	Excellent	Good	Fair	Excellent	Fair	Oct. to March
Stayman Winesap	Good	Excellent	Excellent	Good	Excellent	Nov. to Feb.
Baldwin	Fair	Good	Good	Fair	Good	Nov. to March
York Imperial	Fair	Fair	Good	Poor	Good	Nov. to March
Red Rome	Good	Excellent	Good	Good	Good	Nov. to May
Newton (Albemarle)	Fair	Good	Fair	Fair	Good	Dec. to April
Winesap	Good	Good	Good	Good	Good	Jan. to June
Ben Davis	Fair	Good	Good	Fair	Fair	Feb. to May
Gano	Fair	Good	Good	Fair	Fair	Feb. to May

(Under ideal storage conditions and in favored climatic sections, many varieties remain crisp and fresh much later in season than given in above list, which is average for country as a whole.)

most common in the market are dark green in color and waxy in appearance. When right for eating they are as soft as a ripe pear. The flesh is creamy and velvety. It is better to buy hard avocados and permit them to ripen slowly at home than to buy those that are overripe, bruised, and discolored.

Bananas. Bananas should be yellow in color; the stalks should be filled with bright, firm, plump fruit. They should be not less than five inches in length and for most purposes should be fully ripe or turning ripe if they are to be used at once. Green bananas are desirable if they are to be broiled, fried, or baked, or are to be kept for several days. Bananas are available the year round.

Berries. Berries should be firm, well developed, properly matured, free from dirt, mold, insects, decay, and excess moisture. They are in season during the spring and summer months.

Cherries. Regardless of kind, all of the cherries in one lot should be of one variety. They should be well formed and at the stage of maturity to insure proper completion of the ripening process. They should not be soft, overripe, or shriveled, and should be free from decay, mold, insects, and skin breaks and cracks. Cherries are on the market from May through August.

Cranberries. Cranberries are a fall and winter fruit. The color varies with the variety; the small berries are darker, rounder, and sweeter than the large bright ones. The berries should be fresh, plump, and firm with a high luster, red color, and no decay or mold.

Citrus fruits include oranges, grapefruit, lemons, and limes. The important sources of oranges are California, Florida, and Texas; of lemons, California and Italy; of grapefuit, Arizona, California, Florida, and Texas. The government has a very complicated and detailed grading system for citrus fruits, and includes in it all the regular as well as some combination and special grades. The grades are based upon maturity, juiciness, color, firmness, shape, quality of skin, and amount of decay, bruises, and blemishes. Size has nothing to do with government grades in citrus fruits except in the case of the smaller and less commonly used ones. Large and small sizes of one grade are equal in juiciness, flavor, and general eating quality. Size is governed by climatic conditions, over which the grower has no control. The size is always indicated on the box, and the grade should be.

Some citrus fruit packers use the brand name to indicate the grade. The California Fruit Growers Exchange, through which a large percentage of the California citrus fruits are marketed, uses this plan. Their grades

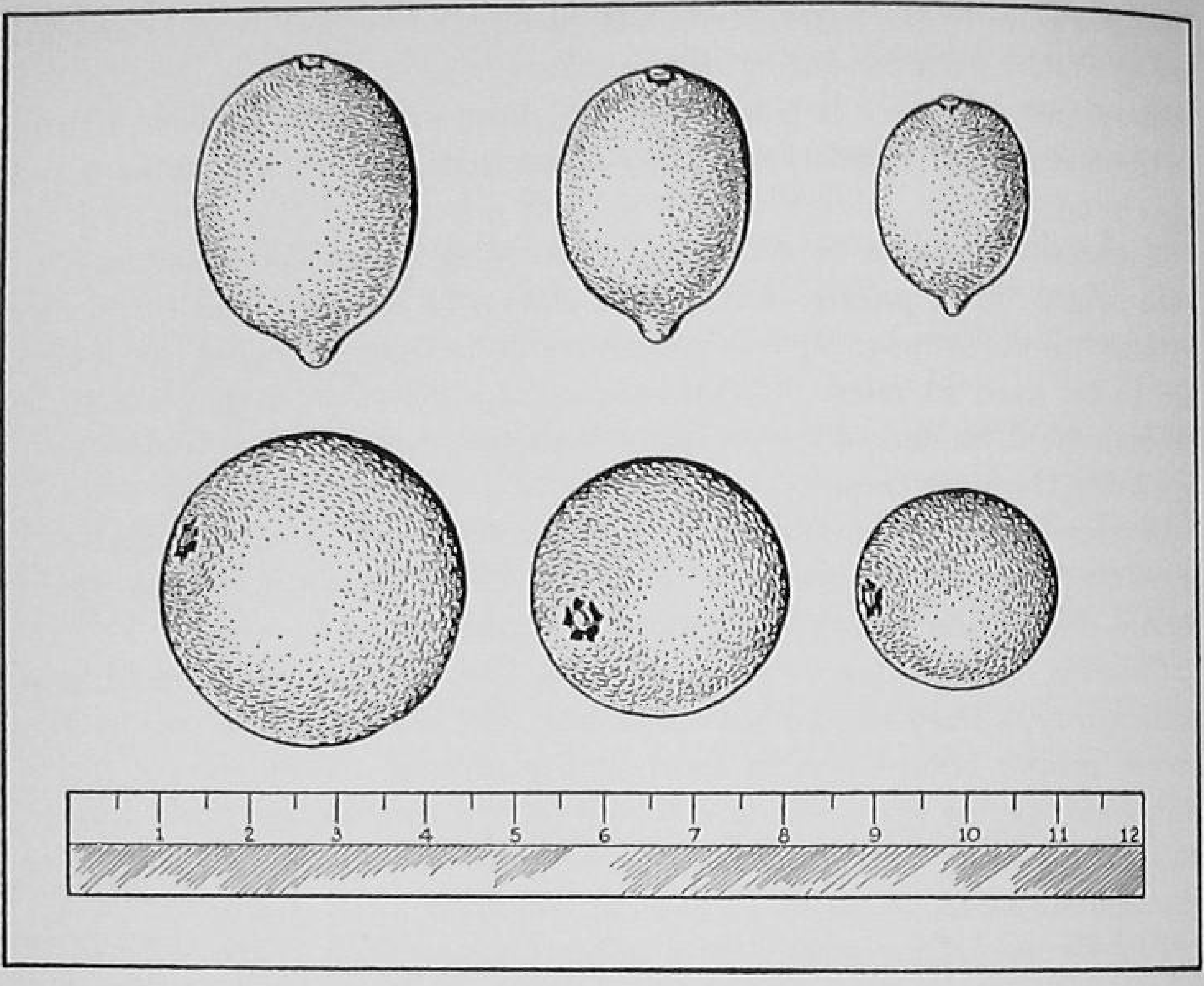


Fig. 102

Oranges and lemons may be equally good in quality although of different sizes.

for oranges and lemons are known as "Sunkist" and "Red Ball." The Sunkist grade includes U.S. Fancy and U.S. No. 1 grades, and the Red Ball U.S. No. 2 grade. Florida and Texas oranges are graded according to the specifications set up by the United States Department of Agriculture for this fruit. There are twelve grades, and consideration is given to the texture and weight of the fruit as well as smoothness and color of skin. Each color of fruit has a number of grades.

Oranges. The two important varieties of California oranges are Navel and Valencia. Navel oranges are seedless and have a skin of deep orange color, a navel end, a distinctive sharp flavor, and are round or ball shaped. Valencia oranges have a thin skin of yellow color with a slight tint of green. They are more oblong in shape than the Navel orange and are sweet and very juicy. Many prefer fruit of the deep orange color, believing that the color indicates ripeness. This is not always the case; the green tinge in the skin of the Valencia increases as the fruit hangs on the

trees and is more pronounced toward the end of the season, that is, in the fall months. In reality, this color is an indication that the fruit is at its best for eating. Navel oranges are on the market from November to May; Valencias from May to November.

Florida oranges include the following varieties: Pineapple, Round, Temple and Valencia. The season is from October to late June.

Full-ripe oranges, no matter what the variety, have a pleasant odor. They should be firm, with no soft or molded spots. The size of oranges varies and standard packs are from 96 to 324 to the box. The size purchased depends upon the purpose for which the orange will be used and the price of the different sizes. Usually the medium sizes, 150 to 216 to the box, are considered the most desirable. Research has shown less waste in orange-juice yield in the medium size. However, because of their low price, the smaller oranges, 252 to 324 to the box, are often economical purchases.

Grapefruit. California and Arizona grapefruit are all white seedless varieties, and are harvested and marketed the year round. Florida and Texas produce both seed and seedless varieties of white, pink and red grapefruit. These are at their best in winter.

Grapefruit skins vary from clear pale yellow to deep russet in color. However, the color of the skin has little or no relation to the eating quality. The fruit should be firm, shaped like a somewhat flattened ball, and heavy in weight. The sizes correspond to those of the larger oranges, the sizes most commonly found on the market being 64, 80, 100, and 126 to the box. Grapefruit are also marketed in baskets and net bags.

Lemons. Lemons are available throughout the year, but are usually most expensive in the summer. They should be of clear whitish-yellow color, firm but not hard, and well proportioned in shape. The desirable sizes are the medium, 300 and 360 to the box.

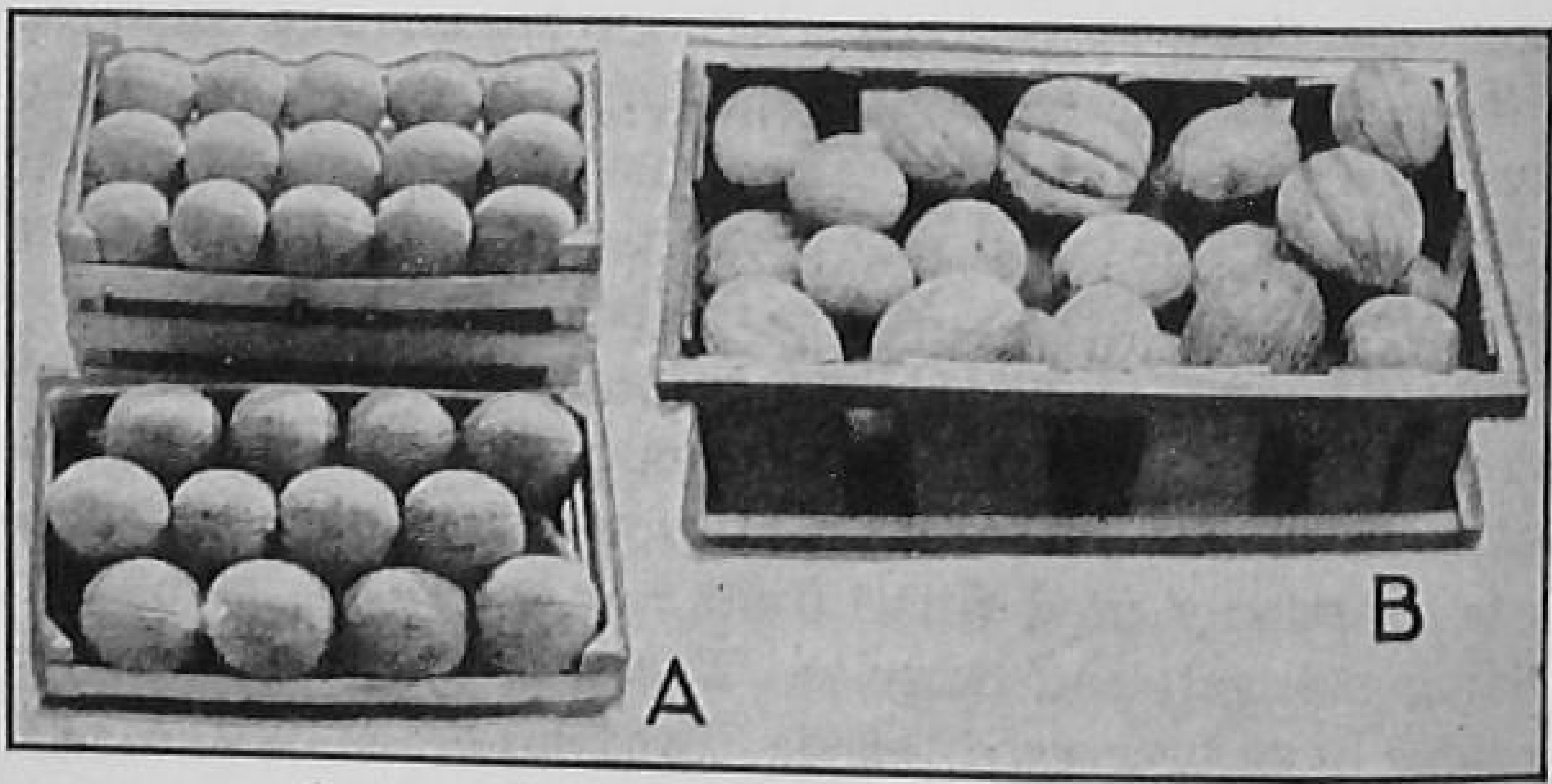
Other citrus fruits. Limes should be green in color. They come in crates but may be purchased in smaller quantities. They usually are less expensive than lemons. Two limes are equal to one lemon in flavoring. Other less commonly used citrus fruits are tangerines, mandarins, satsumas, King oranges, and tangelos. For tangerines and limes, United States grades have been established. Tangelos are graded as large, medium, and small, and are packed in boxes, called half boxes or "straps."

Grapes. Popular varieties of grapes are Concord, Niagara, Delaware, Malaga, Flame, Tokay, Muscat, Ribier, and Thompson Seedless. Grapes are generally classified as eastern and western table and juice grapes, and for each class two to four grades have been established. Grapes should

be free from split, crushed, dried, soft, wet, or molded berries. When lifted, the grapes should not fall off the bunch but stay attached to the stem. The color should be uniform and characteristic of the variety, and the bunches should not be unduly small.

Melons. Included under the name of melons are cantaloupes, muskmelons, watermelons, and honeydew, honeyball, cranshaw, casaba, and Persian melons. Each has its characteristic color, flavor, and aroma. The melon season for the most part extends from May to October, but not all kinds are available all of the time during these months. Melons, to be desirable, should be mature, well formed, heavy for their size, firm, and free from decay, sunburn, and disease. Soft and overripe melons should not be selected. For melons having a large cavity a test sometimes is made by shaking the melon close to the ear. If a rattling noise made by the movement of seeds is heard, the melon is ripe. Thumping, which yields a hollow sound on a green melon, is another means of testing ripeness. A melon that shows decay is never safe for use.

Peaches. Many varieties of peaches are grown throughout the United States, and each is graded into three or four groups. Some are more desirable for canning purposes, and others are better for table use. Peaches are classified under two main groups, yellow-fleshed and white-fleshed, each having both freestone and clingstone varieties. Peaches are highly perishable. Those ripened on the trees are better flavored than those ripened in storage. They should be firm, unless they are to be used im-



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 103

Cantaloupes that have been graded show an evenness of size and regularity that is not characteristic of the ungraded ones. Obviously, wise purchasing would be much easier in the case of the graded melons.

mediately; should have a good color, characteristic of the variety; and should be free from decay, mold, and soft spots. Peaches are in season from May to October. Nectarines are a variety of peaches that have a smooth skin like plums.

Pears. Of the many varieties of pears produced in the United States the Bartlett is the most popular for all purposes. However, this pear is a summer variety in season from July into October. Popular fall and winter varieties for eating are Anjou, Bosc, Comice, and Winter Nelis; and for preserving, Bosc, Chinese Sand, Kieffer, and Seckel. Pears are better if gathered green and ripened in storage. They should be well formed, full-sized, and firm, if they are to be kept for a while. If selected for immediate use, they should be mellow, free from decayed spots, and should not be overripe. A ripe Bartlett pear is yellow in color with a tinge of pink or red. An Anjou is green to creamy-yellow.

Pineapples. The most desirable pineapples are heavy in relation to their size. They are a dark orange-yellow in color, with a fragrant odor. The eyes are flat or almost hollow. When the pineapple is ripe, the leaves can be pulled out of the top easily. Plump, square fruits are better to buy than those that are long and tapering. There should be no mold at the base. Pineapples picked too green are never choice products. This fruit is on the market from April through September. Puerto Rican pineapples have four grades; all others have two.

Plums. A greater variety of plums is now grown than of any other fruit. Preferred varieties include Italian, Santa Rosa and Greengage. If bought for drying, canning, or table use, they should be fully ripe. Shriveled, soft, overripe, bruised, cut, and molded fruit should never be selected. The season for plums is from May to November.

Fresh vegetables

Asparagus. There is but one kind of asparagus, but it may be white or green according to the conditions under which it is grown. The medium and large sizes are most preferred. Asparagus should be crisp, tender, straight, and fresh. The tips should be compact, and the odor should be good.

Beans, snap or string. There are many varieties, colors, and shapes of beans. They should be young, tender, and of good even color, and should snap when broken. Pods should be stringless and straight, not withered, twisted, rusty, or spotty.

Beets. Beets should be firm, tender, reasonably smooth, and clean. If red beets are desired, the color should be a dark or bright red. Ex-

cessively large beets are not desirable. The medium size is two to three inches in diameter.

Broccoli. Broccoli should have compact flowers or heads which are relatively large in comparison with the leaves. The heads should be clear blue-green in color. The stems should be crisp, short, and tender.

Brussels sprouts. Brussels sprouts should be fresh and green in color. The heads should be hard with no discolorations or blight.

Cabbage. The kinds of cabbage are white, red, and Savoy (loosely headed, green with crinkly leaves). The heads should be solid for the kind, crisp, heavy, and well trimmed. The cores should be hard with no decay present. Leaves should show no discoloration or decay. Whether a head of cabbage is considered small, medium, or large depends somewhat upon the variety. Generally, a small head weighs under two pounds, a medium head between two and five pounds, and a large head over five pounds.

Cauliflower. The heads should be compact, white in color, and free from soft or wet decay. The jacket leaves should be fresh, green, and well trimmed. Yellow leaves and spreading flower clusters are indications of poor quality.

Celery. Celery should be well trimmed. The leaf stems, commonly called stalks, should be crisp, brittle, and free from damage, deep cracks, and stringiness. They should also be free from decay and dark streaks. Thin flat stalks are rarely desirable. Celery that is white or light green in color has generally been preferred. However, knowledge of the higher vitamin content of green celery may affect the choice. Pascal celery, green in color, has more succulent stems and is relatively free from strings. Celeriac or celery root is a variety of celery with a root resembling that of the turnip. The root, which is the part eaten, has a flavor similar to celery. Celeriac should be firm and free from cracks, mold and decay.

Chard. The leaves and stalks of chard should all be green and crisp, with no mold or decay.

Chicory, endive, or escarole. The leaves should be crisp, fresh, and tender; the hearts large and yellowish-white or white. There should be no decay or mold. Tough, coarse plants will probably be bitter in taste.

Corn, green. Whether the corn is white or yellow, the husks should be bright green, and the cobs well filled with plump and milky kernels. The ear should be firm, free from insects and damage, and not light in weight. Hard, glazed kernels indicate overmaturity.

Cucumbers. Cucumbers, whether for slicing or pickling, should be fresh, smooth, firm, well formed, and green. Withered, soft, or spongy

ones are undesirable. Those used for slicing should be from six to nine inches in length; those used for pickling should be small.

Eggplant. Eggplant should be firm, smooth, and cylindrical or slightly curved in shape. Usually those of deep purple color are preferred. Large, rough, spongy places indicate poor quality. Regardless of the color — black, purple, or white — six to nine inches in diameter is generally a favored size.

Greens. All greens should be tender, crisp, and a good green color. They should be free from decay, mold, insects, and dirt.

Kale. Kale should be dark green or bluish-green in color. It should have a fresh appearance and be free from yellow or discolored leaves, decay, mold, insects, and dirt. Kale should be examined carefully for plant lice.

Lettuce, head. There are four types of head lettuce: New York, iceberg, butterhead, and cos or romaine. Regardless of the type, head lettuce should be fresh, crisp, well trimmed, firm, without decay and blemishes, and without rot or wilt on the outer leaves. In color, it should range from very light green to white.

Lettuce, leaf. Leaf lettuce should be fresh, not wilted or decayed, free from damage, and good in color for its variety, whether the leaf is green, or green with brown on the outer edge. A plant is never marketable if any seed stalk has formed.

Mushrooms. Under the skin the flesh of mushrooms should be white. The stems should not exceed 1¼ inches in length, and unless otherwise specified, the minimum diameter of the cap should be one inch. Mushrooms should be firm and free from bruises or decay.

Okra. The pods of okra should be fresh, tender, meaty, medium in size, and not badly misshapen. They should be of a light green color.

Parsley. The leaves should be fragrant, green, and free from wilt, decay, and discolored or yellow leaves.

Parsnips. They should be firm, not shriveled or discolored. The root should be nearly white to cream in color, should not be woody nor the stock pithy, and there should be no secondary roots. Large sizes of parsnips are generally best.

Peas. The pods of peas should be fresh, tender, firm, of the same color and general type, and in the same stage of maturity. They should be free from excessive moisture, decay, mildew, and other damage. The pods should be filled at least one half to two thirds with fairly well-developed peas.

Peppers. Regardless of the variety, peppers should be tender and firm,

with fleshy walls. They should be well formed with a clear glossy color and free from decay or blemish.

Potatoes, white. White potatoes should be of one variety, well-shaped, smooth, and medium to large in size. They should be clean, firm, and free from decay. Unless early or "new" potatoes are desired, they should be mature. The skin should be unbroken and should cling tightly. Excessive dirt, scabbiness, sunburn, hollow or black heart, and decay are all objectionable qualities in potatoes. A good potato loses no more than ten per cent of its original weight in being prepared for the table.

The Triumph is a waxy potato. It and similar varieties are recommended for salads and are best when steamed. Irish Cobbler, Early Ohio, and McClure are good all-purpose potatoes. The varieties known as Rural New Yorker and Green Mountain are excellent for boiling, mashing, ricing, baking, and frying. The Russett Burbank, often called the Idaho potato or Netted Gem, is good for baking and frying. Potatoes are graded by the government as U.S. Fancy, U.S. Extra No. 1, U.S. No. 1, U.S. Commercial and Unclassified, or U.S. No. 2. U.S. Extra No. 1 and U.S. No. 1 are preferred for home use. U.S. Fancy is a very large potato and is difficult to cook whole.

Potatoes, sweet. The varieties of sweet potatoes are divided into two classes: the dry type generally preferred in the North, and the moist, sweet type preferred in the South. The Jersey-type varieties, of which the Orlus is one of the most popular, are of the dry class; and the Red Nancy and the Puerto Rico-type varieties are of the other class. A new variety, Kandee, is fast gaining in popularity. Though one of the dry type this sweet potato is moist and sweet but it holds its shape and keeps well. However, it takes longer to cook than other varieties. A deep orange is the standard color for the fleshy part of all sweet potatoes. Regardless of the variety or type the potatoes should be firm, not badly misshapen, and free from black rot, bruises, cuts, scars and other blemishes. There are four grades for sweet potatoes: U.S. Fancy; U.S. Extra No. 1; U.S. No. 2; and Unclassified.

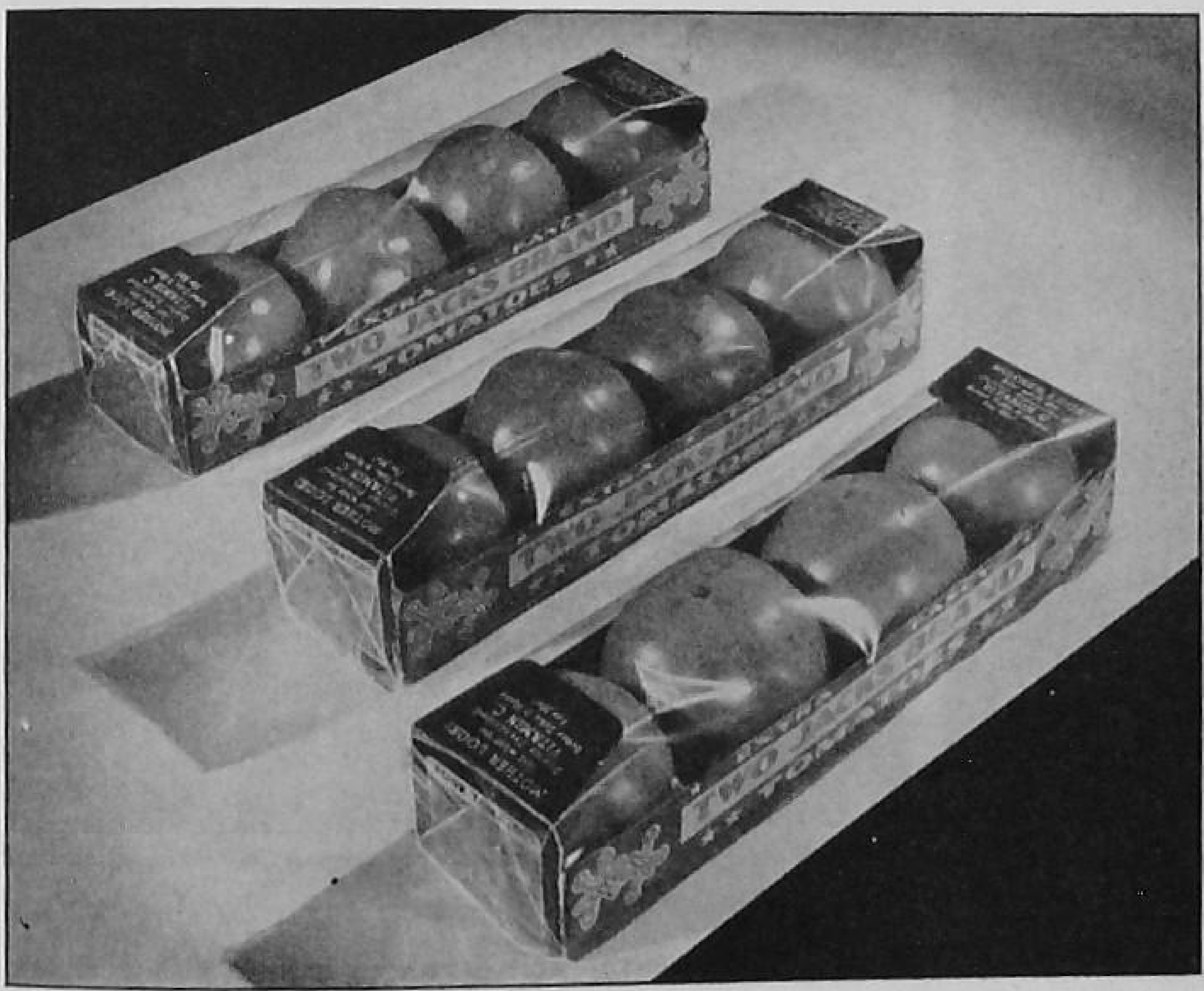
Radishes, bunched. Radishes should be well formed, smooth, firm, crisp, and tender, with fresh green tops. The color should be bright and clear. Small and medium-sized ones are best.

Rhubarb. The stalks of rhubarb should be of good length and of medium thickness, firm, clean, and crisp, with no decay. Unless blanched stalks are desired, the color should vary from green to a bright red color.

Spinach. Spinach should be of a good green color, strictly fresh, reasonably clean, with no coarse stalks and no decay.

Squash. There are two types of squash, summer and winter. Summer squash include such varieties as Pattypan, Cymling, Mexican, Vegetable Marrow, and Zucchini. Summer squash should be fairly heavy for size, and the skin should be easy to puncture. Specimens should be uniform in shape, of medium size, fresh in color, and free from rot. An orange color is undesirable in Pattypan and Cymling squash. Winter squash include the varieties Acorn, Butternut, and Hubbard. These are heavy for size and have a hard rind. They should be clean and well shaped, with an evenly developed color varying from green to orange.

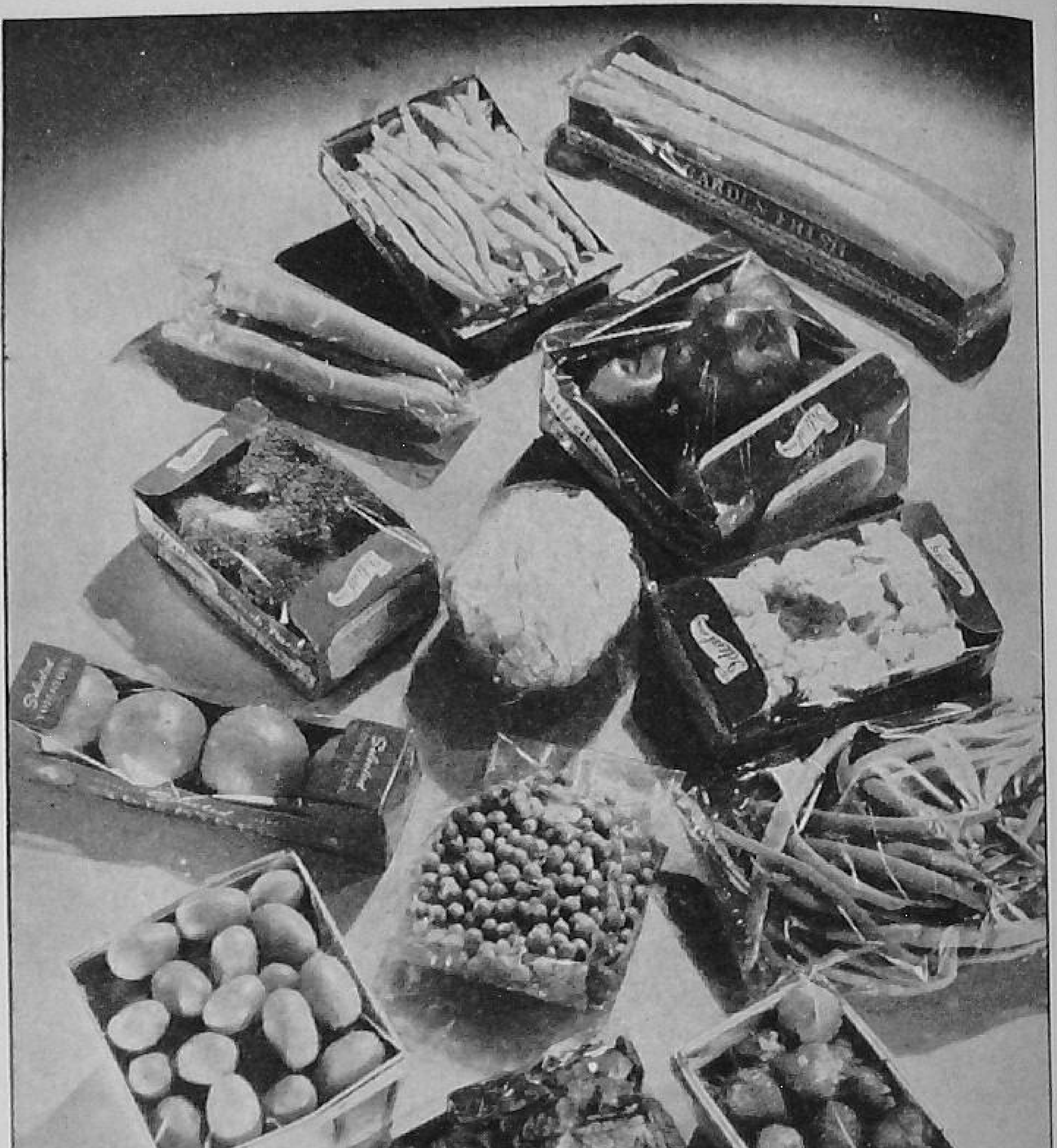
Tomatoes. Tomatoes should be smooth, firm, of good shape and weight. Unless they are of a yellow variety, the color should be pink or red, with no yellow or white spots. There should be no evidence of decay or diseased spots. As a rule, extremely small or large tomatoes are likely to be



Courtesy of Celanese Corporation of America

Fig. 104

The grade is indicated on the package of these fresh tomatoes. A reminder of their nutritional value is also given.



Courtesy of Celanese Corporation of America

Fig. 105

Attractive prepackaging of fruits and vegetables is growing in favor with producers, distributors and consumers.

less desirable, but the variety, season, and methods of production must all be considered in evaluating size. The grades for fresh tomatoes are U.S. No. 1, U.S. No. 2, and Unclassified; the grades for greenhouse tomatoes are U.S. Fancy, U.S. No. 1, U.S. No. 2, and Unclassified. For both types there are also definite specifications concerning the packs.

Turnips. Turnips should be firm, fairly smooth, and free from decay, cracks, spots, or other blemishes. The tops, if they have not been removed, should be fresh and green. Medium sizes are usually preferable.

Water Cress. The leaves of water cress should be brittle and a shiny green in color. They should be free from wilt, decay, mold, and dirt.

Prepackaging

The prepackaging of fresh fruits and vegetables is a well-established marketing procedure. Washed, trimmed and often ready to use with little or no further preparation, these products are available in markets everywhere. Put up in attractive cellophane, polyethelene and net packages and bags, the food is protected and purchasers easily see what they are buying. Usually the products are arranged in appropriate market units that invite purchase. Sometimes vegetables that tend to dry, wilt or shrink, as rutabagas, are given a coating of wax. The better condition of the product, the greater convenience to purchasers, and the reduction of waste that prepackaging and other treatment make possible are all advantages to consumers.

ACTIVITIES

1. Class choose a committee to find out and report the following for your community:
   (*a*) The fresh fruits and vegetables sold by grade.
   (*b*) The fresh fruits and vegetables on which the grade is indicated.
   (*c*) The fresh fruits and vegetables sold by brand or trade name.
   (*d*) The extent to which prepackaged fruits and vegetables are offered in the markets.
   (*e*) The way most people purchase fresh fruits and vegetables.
2. Decide the minimum amount of fresh fruits and vegetables that a college girl needs for a week. Estimate the total cost of these foods.
3. Formulate the standards that a fresh fruit and vegetable market or department in a grocery store should maintain. To what extent will you hold to these standards in purchasing such foods?
4. Class make a chart showing the fresh vegetables available the year round in the local community; make a similar one for fresh fruits.
5. Class develop a buying guide chart for fresh fruits; for fresh vegetables.

PROBLEM 8 *How shall dried and frozen fruits and vegetables be purchased?*

Until recently the drying of foods was a process carried on entirely in the home. This is no longer true, for the commercial drying of foods, especially of fruits, is today one of the important food industries. In the case of frozen foods, the trend was in a sense reversed, for the freezing of foods began industrially and then later found a place in home preservation of food. Among the industries concerned with food processing, the frozen food industry is fast taking a front-rank position. In the average home, both dried and frozen foods often appear in the menu, and hence are frequently purchased.

Types and kinds of dried foods

Dried fruits and vegetables are the clean, sound products that result when the larger part of the water is removed from mature and properly prepared fresh fruits and vegetables. The water removal is done in such a way as to insure good quality in the resultant dried product. The terms *dried*, *evaporated*, and *dehydrated* have much the same meaning and are often used interchangeably by the general public. All refer to the removal of moisture from foods. Dried fruits and vegetables generally are classed as sun-dried and dehydrated. Sun-dried foods are dried without the use of artificial heat, and in the trade are known as "dried foods"; dehydrated foods are dried by the use of artificial heat in a natural draft; and in artificially heated or cooled air that is mechanically circulated under carefully regulated conditions.

Dried foods correspond in name to the fresh foods used in their preparation. With the exception of the legumes, such as peas and beans, dried fruits have a much wider use than dried vegetables. Dehydrated foods are used in the Army field ration, and dehydrated soups, mashed potatoes and milk are familiar products in grocery stores and markets. Recent additions are instant orange and grapefuit juice crystals. These are obtained by drying the pure juices and can be reconstituted quickly with the addition of water.

Grades and standards for dried fruits

The dried fruits in most common use are apples, apricots, peaches, prunes, raisins, currants, pears, figs, and dates. For some of these, grades have been established. The grades are based upon the variety of the fruit used, its size, color, condition, and water content; size, however, is the most significant factor. But these grades are of little value to the consumer, as the product rarely has the grade stated on the label. Instead, brand names are in common use.

Dried apples, apricots, pears, and peaches have five grades: Extra Fancy, Fancy, Extra Choice, Choice, and Standard, or pie fruit or slabs. Each grade has definite standards and specifications. Dates are graded according to their depth of color; the superior ones generally come in packages. Figs are classed as black and white, and each is graded as Fancy, Choice, and Standard. Both unpeeled and peeled peaches are dried; grades in each case depend upon form and size. Prunes are graded according to size, that is, the number of prunes to a pound. Although there are two types of prunes — the sweet (the California or French) and the tart (the Oregon or Italian) — the grades depend chiefly upon size, and are commonly designated as Large, Medium, and Small. Raisins are dried grapes and are prepared as seeded, seedless, and clusters. California Malaga and Muscat grapes are used for the seeded raisins; California Thompson seedless grapes and Turkish Sultana grapes, for the seedless raisins; and California Muscatel and Spanish Malaga grapes, for the clusters. The grades for Muscat raisins are Four Crown, Three Crown, Two Crown, and One Crown, the One Crown being the lowest grade. Large seeded and small seedless are graded Extra Fancy, Fancy, and Choice.

Currants are imported from Greece and must meet certain minimum standards before being admitted for sale in the United States.

Some drying of such foods as cherries, citron, pineapple and citrus fruit peel is done for use in baked foods and candies.

Dried fruits come in packages, most of which carry a brand name that indicates the quality and often the size. Many of the dried fruits are slightly precooked or tenderized to lessen the cooking time.

Dried fruits should be prepared from clean, sound, and properly matured fruit and the methods used should meet good commercial standards. Certification that such has been the case is desirable. When purchased the fruits should be free from insects, dirt, and other foreign material, and should have no mold or musty odor.

Types and grades of dried vegetables

The drying of vegetables is carried on less extensively than is the drying of fruits, as the demand is not so great. Two main types of dried vegetables are found on the market: those that, as fresh or green vegetables, have had their moisture removed by artificial dehydration or evaporation; and those that have matured and dried naturally. Dehydrated spinach, tomatoes, sweet potatoes, corn, and the like are of the first type and are generally designated by the term "dehydrated"; dried seeds of the legumes and cereals, such as navy, lima, and kidney beans, dried peas, and rice, belong to the latter group, and for these the term "dried" is used. Dehydrated and dried vegetables come in packages most of which bear statements concerning the product. Dehydrated vegetables should be clean, of good color, and free from insects. They should have no odor of mustiness. Grades are not commonly available for these products. Dried seeds should be clean, free from insects, and of uniform size and quality.

Use and storage

The use of the food as well as the cost should be considered before a decision is made as to the grade to be purchased. Extra Choice apricots or slabs may be entirely suitable for a whip or soufflé, but the Extra Fancy or Fancy grade will be the better purchase if the apricots are to be served whole as a sauce. Generally, large prunes are a better buy than small ones because there is less waste per pound. However, a great difference in price may make a smaller size yield more food value for the money spent. Some dried foods are less expensive than fresh, and by using them it is easier to stay within the food budget.

Because of their splendid keeping qualities and the smaller amount of storage space required for them, dried foods are convenient purchases for storage. However, they do not keep indefinitely without spoilage or loss in quality. It is unwise to purchase at any one time more than are likely to be used up before deterioration can occur.

Frozen fruits and vegetables

A wide variety of frozen fruits and vegetables are increasingly being made available in many markets throughout the country. Freezing changes the flavor of the food much less than do the canning and drying processes. Studies show that vitamins and minerals are not destroyed by freezing but that some losses of the water-soluble vitamins and minerals occur in blanching and cooking. Thawing, storing at high temperatures, or storing for a prolonged time at any temperature may also re-

sult in significant loss of vitamins. Frozen fruits and vegetables tend to be more expensive than other forms of the foods. However, when the factor of convenience, quality, waste, and time required for preparation and cooking are considered, these products often may be a desirable purchase. To make use of frozen foods, markets and homes must be equipped with refrigeration that will continue to keep the foods frozen hard until they are needed. Frozen foods are available in packages convenient for household use, the smallest and most common unit being ten ounces. The package should completely seal the food. Though all types of fancy packaging are done heavy paraffined containers with no liners or lightly waxed ones with moisture-proof liners are satisfactory. A leaking package is not acceptable and should not be purchased.

Permissive grades have been established by the United States Department of Agriculture for many frozen fruits and vegetables. In general, these are: U.S. Grade A (U.S. Fancy); U.S. Grade B (U.S. Choice); U.S. Grade C (U.S. Standard); Grade D (Substandard). They include very detailed specifications in regard to selection of the fresh food, processing before freezing, freezing process, containers, adulterations, color and flavor. These grades, however, have very limited use in the retail market.

The frozen food industry some time ago adopted voluntary quality standards for all frozen food products, including descriptive labeling on all packages. This has been a helpful measure for consumers. However the company's name, brand names, and products are at present the most important considerations in the purchase of frozen foods.

Frozen ready-to-serve and frozen ready-to-cook foods are among the latest developments in the frozen food industry. Such processed foods are making great changes in food marketing facilities and buying practices. Even though these foods are in the more expensive class of foods they are having wide acceptance in homes everywhere. Many of these foods include vegetables or fruits in their list of ingredients. Some of the most popular foods are French fried potatoes that can be heated while the steak is broiling; cake and ice cream roll or baked Alaska that requires only a few minutes out of the freezer for serving; chicken, meat and fruit pies that are ready for baking; and fish that is breaded for frying. An individual frozen meal consisting of meat or fowl, dressing, potato, and a vegetable and requiring only a few minutes of oven heating, is now available in most markets. Many of these products are in attractive aluminum foil containers in which the food is heated and which can also be used for the serving dishes. With the extensive development of the frozen food industry and the increased use of the products, the acceptance and use of

government inspection and grading services should be a standard practice with all frozen food processors.

ACTIVITIES

1. Find out the following for your community:
   (*a*) The dried fruits and vegetables now available in the markets.
   (*b*) The effect of season on the availability of dried fruits and vegetables.
   (*c*) The extent to which the terms *sun-dried*, *evaporated*, and *dehydrated* appear on packages of dried fruits and vegetables.
   (*d*) The new dried fruits and vegetables on the market.
2. Compare the prices of:
   (*a*) Dried and fresh fruits and vegetables.
   (*b*) Dried, frozen, and fresh fruits and vegetables.
   To what extent is food waste a matter of consideration in the price of each of these?
3. Form into groups and each group develop an informative label for a given frozen food. Exchange labels and evaluate these in terms of their value as buying guides.
4. Class make set of rules for the proper home storage of dried fruits and vegetables; of frozen fruits and vegetables; of frozen foods; ready-to-cook and ready-to-serve foods.

PROBLEM 9 *How shall dairy products be purchased?*

Dairy products are widely used foods. From a nutritional standpoint they are basic; they are essential in every diet. The large sums spent for dairy products and the special hazards in their production and marketing demand that careful consideration be given to purchases of these foods. The nature of dairy products makes them an excellent medium for the growth of living organisms which may have an adverse effect on their quality. The Federal Government recommends certain grades and standards for the production and merchandising of dairy products, and some states and cities have accordingly made regulations to govern these foods as produced and sold locally, but many communities are still left without any protection whatever. At the present time, though, nearly 1600 cities and towns and over 400 counties in the United States have

adopted the Milk Ordinance recommended by the United States Public Health Service.

Milk

The grades of fresh milk are based upon the health of the cow, the conditions under which the milk is produced and marketed, the butter fat content, the bacterial count, the cooling temperature, whether the milk is raw or pasteurized, and whether adulterants or preservatives have been used. These grades, according to the Milk Ordinance of the United States Public Health Service, are shown in Table 60.

No matter what grade or kind of fresh milk is purchased, it is safest to buy milk that has been pasteurized or sterilized. If pasteurized milk is not obtainable, the milk should be boiled or pasteurized at home or evaporated milk, a sterile product used, unless for some reason the physician has ordered raw certified milk. Most of the certified milk sold now is pasteurized as practically all public health authorities recommend that this grade of milk be so treated. It is advisable to buy as good a grade of milk as can be afforded. A poor grade of milk can never be made into a high grade, no matter how carefully it is pasteurized. It can only be made safe for consumption. It is also well to remember that the grade label on a bottle means very little unless the regulations back of the grade and the efficiency with which they are enforced are known.

Vitamin D milks of various kinds are now on the market and different methods are used to produce this type of milk. On the containers in which the milk is marketed the Vitamin D potency of the product should be stated. Vitamin D milk should contain at least 400 U.S.P. units per quart, the minimum standard recommended by the United States Public Health Service.

Homogenized milk is now prepared and distributed by many dairies throughout the United States. This type of milk is finding increasing use, and many consumers insist that homogenized milk tastes and looks richer than regular whole milk. Some prefer it to cream on cereal and in coffee. In certain localities homogenized milk costs more than regular whole milk, but in many places the price is the same for both. Vitamin D homogenized milk is available in most markets and is increasingly being used.

Half and half is another milk product that is sold in many communities. It is a mixture of half milk and half cream containing not less than 11.5 per cent of milk or butter fat. Usually it is homogenized.

Skim milk and a milk from which much of the fat has been removed,

Table 60. GRADES OF MILK *

Grade	Average Bacterial Plate Count per Cubic Centimeter	Maximum Cooling Require-ments	Sanitary Requirements Regarding Production and Methods of Handling up to Delivery
Certified milk — raw	Less than 10,000	40° F.†	Must conform to all requirements of American Association of Medical Milk Commissions. These are extremely high in every detail.
Certified milk — pasteurized	Less than 10,000	40° F.†	Same as for certified milk, raw.
A — consumed raw	50,000	50° F.†	Must comply with all specified sanitary requirements of the United States Public Health Service Milk Ordinance. These are very high, but not as high as for certified milk.
A — for pasteurization	200,000	50° F.‡	Same as for Grade A raw except a two-room milk house not required.
A — pasteurized	30,000	50° F.§	Same as for Grade A raw, plus a lip-cover cap.
B — consumed raw	1,000,000	50° F.†	Same as for Grade A raw except abortion testing of cows not required.
B — for pasteurization	1,000,000	50° F.‡	Same as for Grade B raw.
B — pasteurized	50,000	50° F.§	Same as for Grade A pasteurized except lip-cover caps are not required.
C — consumed raw	No limit	None	No requirements.
C — for pasteurization	No limit	None	No requirements.
C — pasteurized	No limit	None	No requirements.

Vitamin D milk shall be only of certified, Grade A or Grade B pasteurized, or Grade A raw quality.

Homogenized milk being a pasteurized milk is graded according to the standards for other pasteurized milk.

* Adapted from Revision of Public Health Bulletin No. 220, 1953, Milk Ordinance and Code. Recommended by the U.S. Public Health Service, Federal Security Agency, U.S. Public Health Service, Washington, D.C.

† Cooled immediately and held until delivery.

‡ If pasteurization is to be within two hours after delivery, maxium cooling temperature may be 70° F.

§ Cooled immediately after pasteurization and held until delivery.

and sometimes dry milk solids added, are available in many markets. Buttermilk too, may often be purchased.

The method of handling is also an important consideration when purchasing milk, as contamination can come after the milk leaves the dairy. The only safe way to buy milk is to obtain it in properly sterilized paper cartons and glass bottles that have been carefully filled and capped at the dairy and kept cold until delivery. Milk sold from an open can or pitcher is never safe.

Generally speaking, one or two days' supply of fresh milk is sufficient to purchase at one time, unless refrigeration or other storage facilities are adequate and efficient enough to care for more, and unless there are good reasons for the larger purchase. If no refrigeration facilities are available, it may be wise to buy only enough for one meal at a time, especially if the weather is warm.

Considering its nutritive value, milk is a relatively inexpensive food. The standard amount of milk to purchase is one quart per day for each child in the family and at least one pint per day for each adult. This standard should be followed as closely as possible.

In buying fresh milk the following considerations are important:

1. Types of milk available.
2. Grades and price for each type of milk.
3. The probability of adulterants or preservatives being used.
4. Odor and flavor.
5. Visible dirt.
6. Milk or butter fat content; solid content.
7. Acidity.
8. Type of container.
9. Type of cap on container.
10. Conditions under which produced and marketed.
11. Proper amount for the family.
12. The uses to which milk will be put.
13. Amount to be purchased at one time.

If the price of fresh milk in a locality is exceedingly high or if there is a scarcity of supply, processed milks can be used to supplement the supply or as an alternate. Processed milks include: dried milk, skim and whole; condensed (sweetened) milk and evaporated milk which is homogenized and fortified with Vitamin D. Instant dried milks that make their preparation for use very easy are now available. These milks can also be used when safe, fresh milk is impossible to obtain, and are always convenient to have on hand for emergencies and special uses. The price of the proc-

essed milks is in keeping with the general price of milk and frequently is less than that of fresh milk. Evaporated milk, as a rule, is the least expensive of all the available whole milks. Federal standards have been fixed for condensed, dried, and evaporated milks. These include percentages of milk or butter fat, moisture, and dry milk solids. Only products that meet these standards should be purchased. At the present time all processed milks are best purchased according to the brand and the information given on the label of the can or package.

Cream

The United States Public Health Service Milk Ordinance grades sweet cream in the same manner as milk, except that the bacterial standards are doubled for cream. Grade A raw cream is cream separated from Grade A raw milk with a bacterial count not in excess of 100,000 per cubic centimeter, prior to delivery. The other grades of sweet cream are defined in a similar manner. No bacterial standards have been established for sour cream. Most states have compulsory cream-grading laws, but there is little uniformity among them, and because they are aimed chiefly at grading cream for manufacturing purposes, they differ widely from the United States grades.

Sweet cream is sold under the names of coffee or light cream and whipping or heavy cream. Heavy cream costs more than light. However, many consumers find it more economical to buy the heavy cream and thin it than to buy the light. The use of cream may be expensive and if purchased daily, it quickly takes more than its share of the budget for dairy products. As a general practice, it is much better to buy whole milk than to buy cream only, both from a nutritional and an economic point of view.

A cream specially processed to increase its keeping qualities is now available and is sold under a trade name developed by the producer. In its preparation a vegetable stabilizer called "algin" and some salt are added to cream that is "99.8 per cent real cream" by weight; the mixture is subjected to "flash" sterilization (260°–280° F.) for a specified time, under pressure and then sealed. This cream will keep 180 days sealed and refrigerated at 32° F. After being opened, it will keep at regular refrigeration temperatures for at least a week. Both 18 and 40 per cent cream thus processed can be purchased. Whether the price is more or less than that of regular cream depends upon local conditions.

Recently dried cream has come on the market. Its use has been mainly in hot coffee and tea though other uses are indicated. Keeping qualities

and convenience make it a desirable product as does the price which is less than that of fresh cream.

Butter

Butter is generally known in the markets as salted and sweet butter. Both are made from sweet or sour cream, usually pasteurized. Salted butter is butter to which salt has been added in the proportion of two pounds of salt to ninety-eight pounds of butter. Sweet butter is unsalted butter.

Butter is purchased mainly in the package but in some places some bulk butter is sold. Most of the butter sold in the retail market is creamery butter. The United States Department of Agriculture has developed permissive grades for butter which are based upon body, color, flavor, and salt. Much graded butter is sold in retail markets. This is largely due to the authorization of the use of "certificates of quality" in packages officially graded AA or A. The U.S. grades of butter and their equivalent scores are as follows: U.S. Grade AA or U.S. 93 Score; U.S. Grade A or U.S. 92 Score; U.S. Grade B or U.S. 90 Score; U.S. Grade C or U.S. 89 Score; U.S. Cooking Grade; and No Grade. The first three grades are recommended for home use.

In purchasing butter known to be produced under sanitary conditions, the flavor and odor are probably the most important considerations. The texture should be firm and waxy, and the color should be uniform and somewhat pronounced. As with milk, the best grade that can be afforded should be bought. Butter made from pasteurized cream and handled in a sanitary manner is the safest to buy. Though some states require that butter in consumer packages carry a grade designation, in most states in the retail market the better grades of butter are generally sold by brand, each company establishing its own brand or trade names for each grade so marketed. When such is the case once a satisfactory brand has been found, its continued purchase simplifies the buying of this commodity. The price of butter depends greatly upon general market conditions. Buying butter in large quantities for the home is not practical under ordinary home conditions and storage facilities. Quantity purchasing requires special refrigeration, such as that provided in a home freezer or freezer locker. Most families find that a week's supply is probably the maximum that can be stored and kept satisfactorily. The amount of butter or table fat that families require varies. Some use from a quarter of a pound to half a pound per person per week, and others up to as much as one pound per person for the same period. However, if the amount per

person per week is much above three quarters of a pound, it is well to examine the diet carefully to see whether all food essentials are properly represented.

Margarines made of all vegetable fats or of a combination of vegetable and animal fats may take the place of butter in the diet. These are available in all markets at a lower cost per pound. Many margarines are enriched or fortified with added vitamins and minerals to make the food value of the products equivalent to or greater than that of butter in respect to these nutrients. Margarines are commonly sold by brand in packages similar to those used for butter. Only enriched or fortified products should be purchased.

Cheese

Cheese is being used more and more as an item of diet in the United States. The annual per capita consumption is now approximately eleven pounds with nine pounds being American or American-type cheese. To meet Federal standards most cheese must be made from pasteurized milk. Pasteurized process cheese is being increasingly used and is sold in grocery stores and markets everywhere. Most of the "European" cheeses are now made in this country and can readily be obtained in many localities.

The United States Department of Agriculture recommends specific definitions and standards in regard to the production of cheese. For some cheeses, grades have been determined. Where this has been done, the grades are based on flavor, body, texture, finish, appearance, and color. Whole milk American Cheddar cheese of all styles has been so graded. The grades thus established are U.S. Grade AA or U.S. Fancy; U.S. Grade A or U.S. No. 1; U.S. Grade B or U.S. No. 2; U.S. Grade C or U.S. Undergrade. However, this grading is seldom indicated on retail products. Cheese is sometimes classified as to age, or as to flavor, texture, and color, in which case three qualities are listed under each characteristic. Thus the flavor is fresh, mild, or aged; the texture, close, medium close, or open; the color, uncolored, medium-colored, or high-colored. Some manufacturers are grading their cheese according to these standards. The grade mark is on the rind or container. A score of 93 or 92 means first quality. The grading of Swiss cheese is based largely upon the eye formation or holes. Large, evenly distributed eyes indicate the best quality, and small eyes or pinholes, a poorer quality, sometimes known as "blind" Swiss.

Unripened cheese has poor keeping qualities; hence only such quantities of these varieties as can be immediately consumed should be pur-

TABLE 61. CHEESE IN COMMON USE

Type	Use	Name	Market Units
Hard cheese	In various cheese dishes (general cooking, grinding, slicing)	American Cheddar	Round, loaf, sliced, bulk
		Swiss	Loaf, sliced, bulk
		Cheshire (England)	8 oz. box, 6 portions
		Parmesan (Italy)	2 oz. bottle or glass jar
		Pineapple (American)	10 oz. 18 oz. 27 oz.
		Edam (Holland)	Red "cannonballs" or in tins, 3–4 lbs.
Semi-hard or semi-soft	For slices, cubes, rectangles, or wedges	Brick (American)	Brick (5 lbs.)
		Gorgonzola (Italy)	Bulk
		Roquefort (France)	¼ lb. foil package, bulk
		Stilton (England)	Bulk
		Blue (American) (Argentine)	¼–1 lb. foil package, bulk
Soft ripened	Chiefly for sandwiches, salads, and desserts	Edelweiss (Germany)	6½ oz. tin
		Brie (France)	6½ oz. tin
		Camembert (France)	4¾ oz. wooden box 6 oz. foil package — 6 portions
		Neufchatel (France)	2¼ oz. foil package
		Liederkranz (American)	Small package
		Limburger (Belgium)	1 lb. package or less
Soft unripened	Chiefly for sandwiches, salads, and desserts	Cottage	12 oz. cartons, bulk
		Cream	3 oz., 8 oz., and 3 lb. packages

chased. Ripened cheese keeps for a longer period. Certain ripened cheeses, such as American Cheddar and Swiss, can be tested by rubbing a small piece between the fingers. If it is not rubbery, pasty, or mealy but works smoothly, and also if it is not weak in its characteristic flavor, it is ripened. Cracks, bulges, high or off color, and irregular shape may indicate poor quality.

An ever increasing variety of cheese spreads are available in most markets and the sale of the products indicates their popularity. Made of soft American cheese to which has been added such foods as pimento, bacon,

pineapple, olives, pickles and chives, these spreads have many interesting uses in menu plans.

The use for which a cheese is desired should determine the type to be bought. Table 61 shows the uses of the most common cheeses. In buying cheese, one should note its flavor and odor. If it seems out of the ordinary for that particular cheese, the product is probably not of the best quality.

American cheese is relatively inexpensive, the price depending upon the current price of milk and cream. Some cheeses, especially if imported, are extremely expensive as well as unusual in flavor and appearance. Their cost in relation to the food budget will rule many of them out of the diet of most families. Often these are not enjoyed to the extent of the cost that they entail.

Ice cream

Ice cream has become almost an indispensable food with the American people, and is now extensively produced outside of the home. Because approximately 85 per cent of its contents are milk and milk products, it is classed as a dairy product.

Ice cream can be purchased in bulk in almost any amount; in pint, quart, half gallon, and gallon cartons; in bricks, usually 1⅛ to 1¼ pounds in weight; and in various shapes and molds either packed or unpacked. Most states have established standards of their own for ice cream, but these vary widely. Some are high and some are not; some emphasize one point and some another. All have a butter fat requirement ranging from 8 to 14 per cent. In any standard, the number of bacteria should be designated and should not exceed 50,000 per cubic centimeter. The "mix" should be pasteurized before freezing.

A typical ice cream "mix" consists of 80 per cent cream and milk, 15 per cent sugar, 4.5 per cent flavoring, and 0.5 per cent stabilizer (gelatin). Only ingredients of good quality should be used in ice cream, and fresh products are preferable. The flavor should be derived from the fat, sugar, and flavoring, and not from the stabilizer or other ingredients used. It is also important that the "overrun" or "swell" is between 90 and 100 per cent (that the quantity be not more than doubled by whipping in of air), that the bacteria count for the firm's ice cream is low, and that the ice cream is made and marketed under sanitary conditions. In the absence of the compulsory grading or informative labeling of ice cream, the consumer must depend upon the reliability of the producer and of the firm marketing the product to obtain such assurance. As a rule, the

quality and acceptability of ice cream become well known and the brand or trade name of a producer comes to indicate a high or low quality product to the consumers of a given area.

In many localities such products as ice milk, frozen filled milk, "imitation ice cream," and frozen custard are sold. In states where their sale is permitted these are not allowed to be called ice cream. Ice milk has a lower fat content than ice cream; frozen filled milk and "imitation ice cream" contain vegetable fat instead of milk or butter fat; and frozen custard contains eggs or egg yolk and the same or less fat content according to the state requirements. The standards for these products and the guides for purchasing them should be the same as for ice cream.

ACTIVITIES

1. Class form into committees. Ascertain for your community the following and report findings to the class:
   (*a*) Ordinances and regulations relating to the sale of dairy products.
   (*b*) The types of fluid milk offered for sale.
   (*c*) The grades of milk and cream sold.
   (*d*) The varieties of cheese offered for sale.
   (*e*) The extent to which pasteurized dairy products are sold.
2. Compare your state laws relative to the production and sale of dairy products with those of a neighboring state; with those recommended by the United States Public Health Service.
3. Find out for your locality:
   (*a*) How nearly the ice cream sold meets the standards suggested by the Federal Government.
   (*b*) The various ice cream substitutes sold and how these compare in price with ice cream.
4. Plan a label for ice cream that would be helpful to the purchaser.
5. Estimate the amounts of the various dairy products your family must purchase each week to meet this part of the "Basic Seven" recommendations.

PROBLEM 10 *How shall eggs be purchased?*

The use of eggs in the American diet has shown a marked increase in the past two decades. This may be due in a large part to improved production and handling methods, as well as to a recognition of the nutri-

tional value of eggs. Although an egg per person per day is recommended, the average per capita egg consumption is considerably less than that. For a family of four, an egg per person per day would mean that at least ten dozen per month and one hundred and twenty dozen per year would be required. The purchase of such a quantity of any commodity should be made with an intelligent understanding of various grades and kinds available on the markets and what means, if any, exist by which a desired quality can surely be obtained.

Types or classes

Eggs are available on the market as fresh, storage, processed or shell-treated, frozen, and dried. The recommended United States standards for quality shell eggs specify that "fresh eggs shall be eggs that are of relatively recent production or that have the characteristics of relatively new-laid eggs and that have not been held under refrigeration for a period in excess of 29 days." Cold-storage eggs are generally those held in special storage rooms for three to nine months at a temperature of 30–31° F. under proper atmospheric conditions. The United States standards define two classes of storage eggs. Storage or refrigerator eggs are those that have been held under refrigeration for a period in excess of 29 days. Short-held eggs are those that have been held for a short period in cold storage or that have been held for a time on the farm, in the packing house, or by the dealer, and have lost some of their "fresh" characteristics but do not have the full characteristics of eggs that have been in cold storage for some time.

All grades are stored, but the better grades are preferred. March, April, May, and June are the months in which most of the eggs are put into cold storage, because eggs are of excellent quality during these months of surplus production. Usually the price is lower at this time.

Many persons, who do not have the correct understanding of the terms "fresh" and "storage" as applied to eggs, often think that storage eggs are far less desirable than fresh. This is not necessarily the case. Research indicates that an April storage egg is likely to be a good egg when it is stored and its deterioration in storage is relatively slow. Therefore for a period of six or seven months its interior is apt to be actually better than that of the average "fresh" eggs which reach the market at this time. Eggs kept at room temperature for several days in July or August would lose as much of their fresh qualities as they would if kept seven or eight weeks in a good refrigerator. The term "fresh" originally meant freshly laid eggs, but has lost its connotation of time, and is now widely

TABLE 62. UNITED STATES CONSUMER GRADES FOR INDIVIDUAL SHELL EGGS

United States Department of Agriculture

	U.S. Grade AA	U.S. Grade A	U.S. Grade B	U.S. Grade C
Shell	Clean; unbroken; normal.	Clean; unbroken; normal.	Clean; unbroken; may be slightly abnormal; may show slight stains but no adhering dirt.	Clean; unbroken; may be abnormal; may have slight to moderate stained areas (not more than ¼ shell surface) but no adhering dirt; prominent stains not permitted.
Air cell	⅛ inch or less in depth; practically regular.	2/8 inch or less in depth; practically regular.	⅜ inch or less in depth; may show unlimited movement; may be free but not bubbly.	May be over ⅜ inch in depth; may be free or bubbly.
Yolk	Well centered; its outline only slightly defined when egg is twirled before candling light; free from apparent defects.	Fairly well centered; outline fairly well defined when egg is twirled before candling light; practically free from apparent defects.	May appear off center with outline well defined when egg is twirled before candling light; may appear slightly enlarged or flattened; may show other definite but not serious defects.	May be off center and its outline plainly defined when the egg is twirled before candling light; may appear dark, enlarged and flattened; may show clearly visible germ development but no blood due to such development; may show other serious defects that do not render egg inedible; small blood clots or spots may be present.
White	Clear; firm.	Clear; reasonably firm.	Clear; slightly weak.	May be weak or watery.

Fig. 106 **U. S. STANDARDS FOR QUALITY**

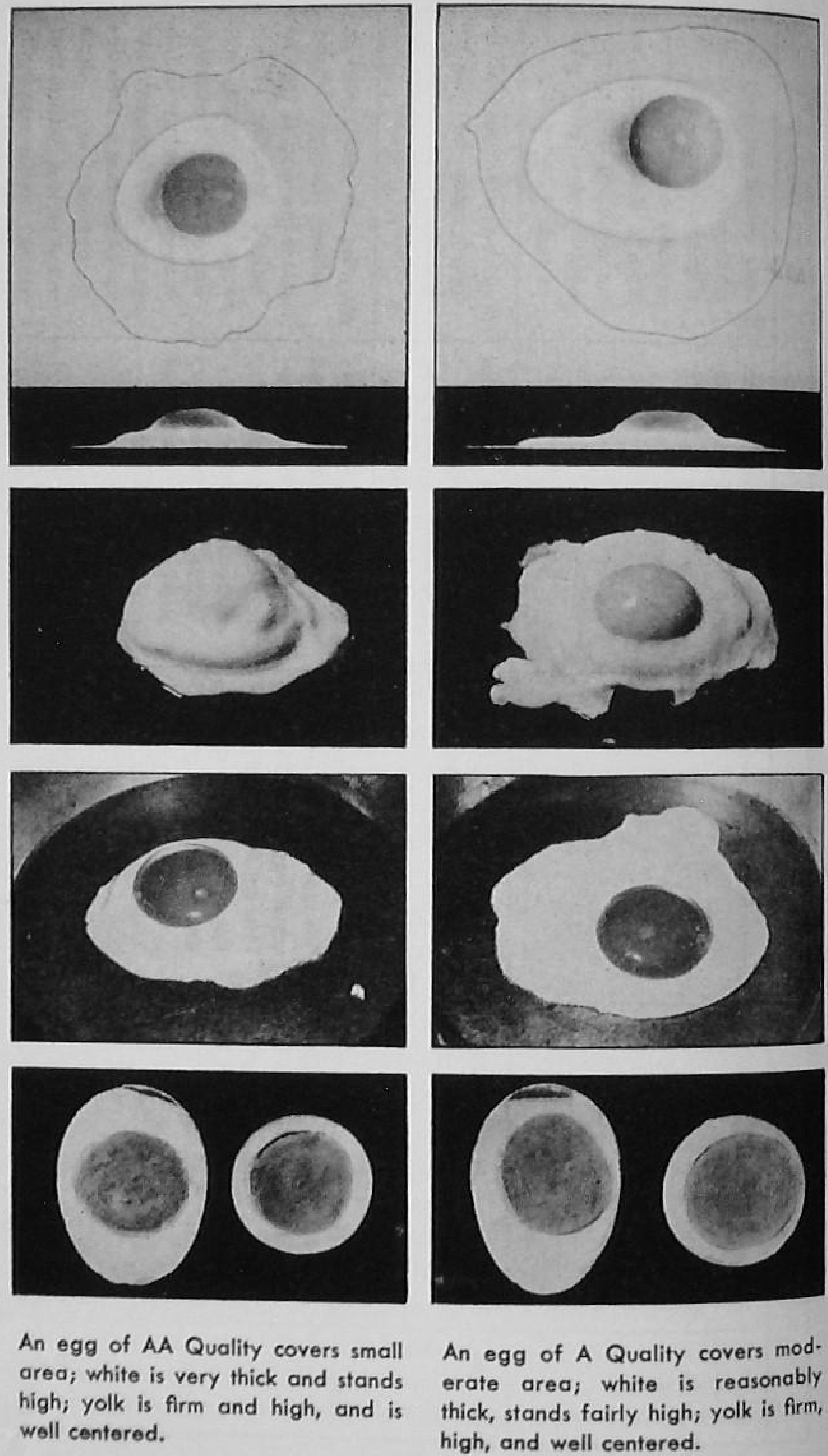
U.S. Grade **AA** | U.S. Grade **A**

Raw

Poached

Fried

Hard cooked

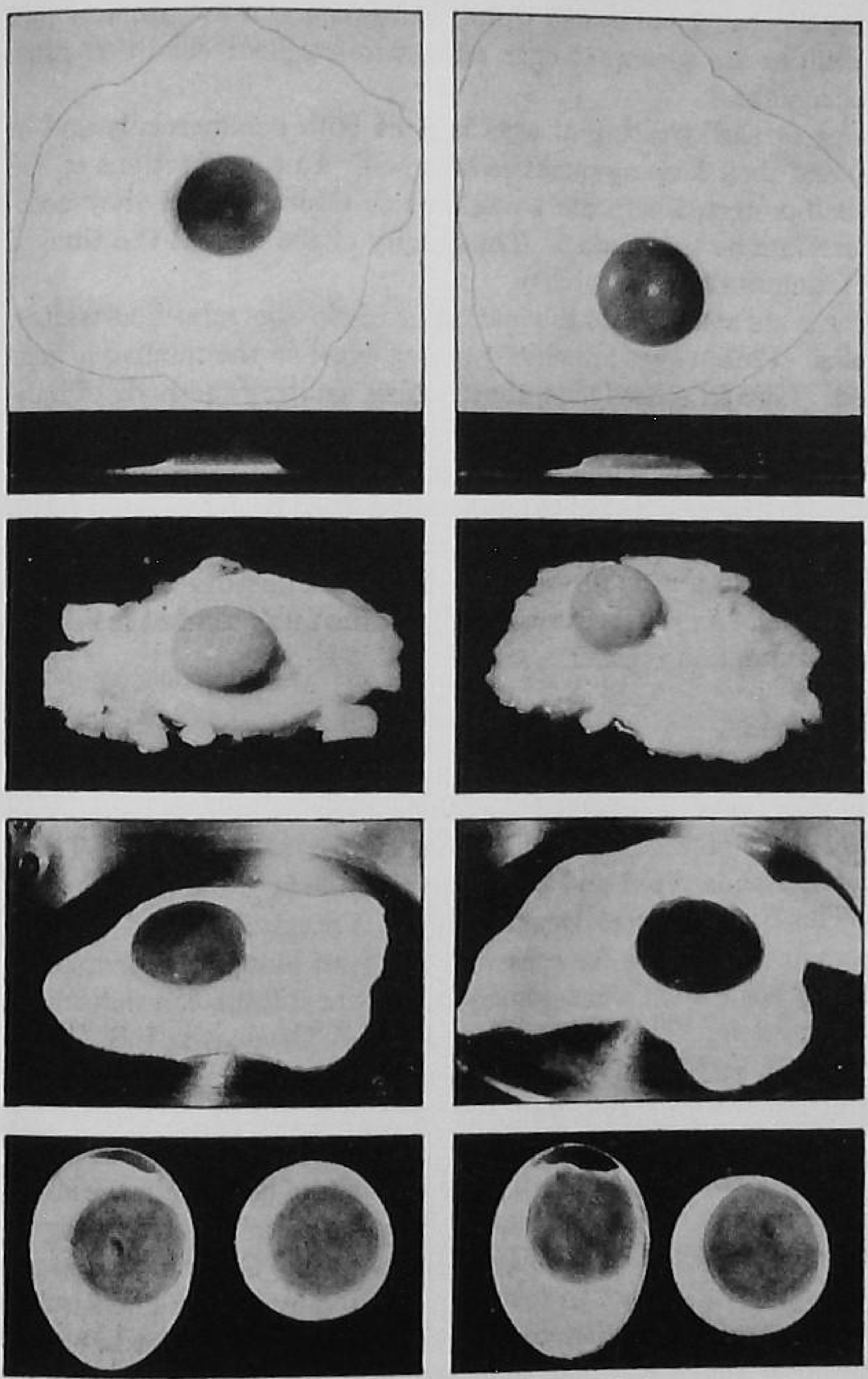


An egg of AA Quality covers small area; white is very thick and stands high; yolk is firm and high, and is well centered.

An egg of A Quality covers moderate area; white is reasonably thick, stands fairly high; yolk is firm, high, and well centered.

FOR EACH OF THE FOUR GRADES OF EGGS

U.S. Grade B — U.S. Grade C



Raw

Poached

Fried

Hard cooked

Courtesy of United States Department of Agriculture, Washington, D.C.

An egg of B Quality covers wide area; has small amount of thick white; yolk is somewhat flattened, enlarged, and off center.

An egg of C Quality covers very wide area; white is thin and watery; yolk is flat, enlarged, off center, and breaks easily.

used to designate eggs of high quality, both freshly laid and storage; this is evidenced by the recommended United States Standards. Modern cold storage facilities are such that eggs remain in excellent condition after storage for months.

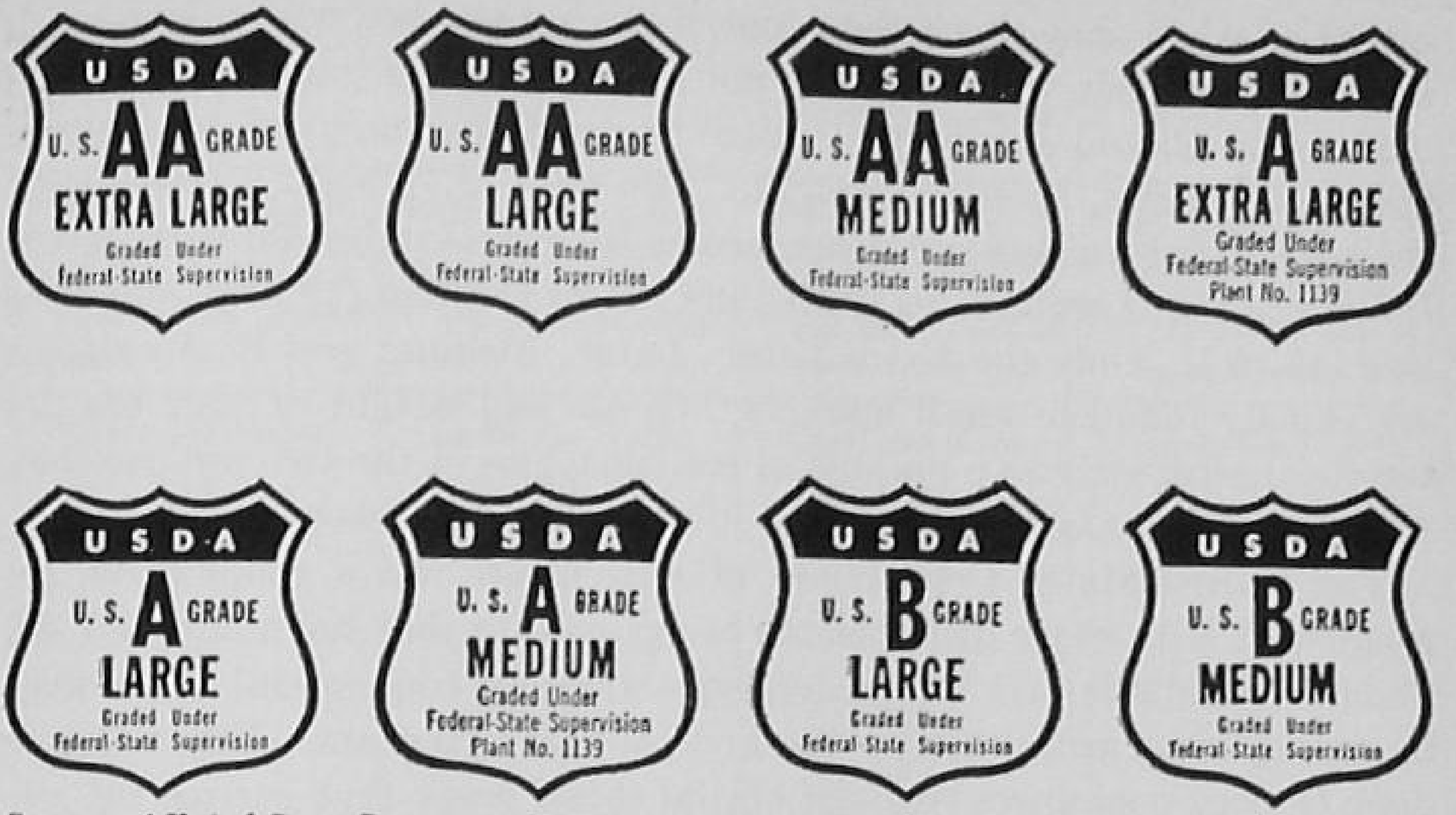
Processing or shell-treating of eggs is done both commercially and in the home, and their keeping qualities are good. In some sections of the country shell-protected eggs are considered so desirable that they command a premium on the market. The quality of the eggs at the time of sealing determines their desirability.

Frozen eggs are available on the market as whole eggs mixed, as whites, and as yolks. Frozen eggs are chiefly spring eggs; so the quality is generally good. Like all other foods, they require sanitary methods of handling. The use of frozen eggs is largely limited to institutional food preparation and to various food industries.

Eggs are also increasingly being marketed in dried or dehydrated form. The whites and yolks may be dried separately or mixed together. Commercially they have a wide use not only in food industries but in other industries as well. As yet their availability in the retail market is limited and home consumption is small.

Grades and classes

Though grading of eggs is required in many states and the practice followed in many retail markets of the others, eggs are still sold simply as fresh, selected, or storage, or under other similar terminology. These terms are not standardized and hence are not a safe guide to wise purchasing. The United States Department of Agriculture has developed retail grades and standards for eggs which suggest standards for quality and serve as a basis upon which states and business firms can determine their grading system. There are four grades: U.S. Grade AA, U.S. Grade A, U.S. Grade B, and U.S. Grade C. Each has definite specifications for condition of the shell, air cell, yolk, white, and germ. U.S. Grade AA and U.S. Grade A are the best grades and likewise the highest in price. Eggs of these grades are especially fine for methods of cooking in the shell, poaching and frying. The other grades are more suitable for cooking in which appearance and delicate flavor count less. Eggs indicated as "dirty" and "check," although lowest in price, may not be undesirable if they are of a good grade otherwise. Checks and dirties do not have the keeping qualities that clean and uncracked eggs do, so early use is important. Table 62 shows the United States retail grades and their qualities.

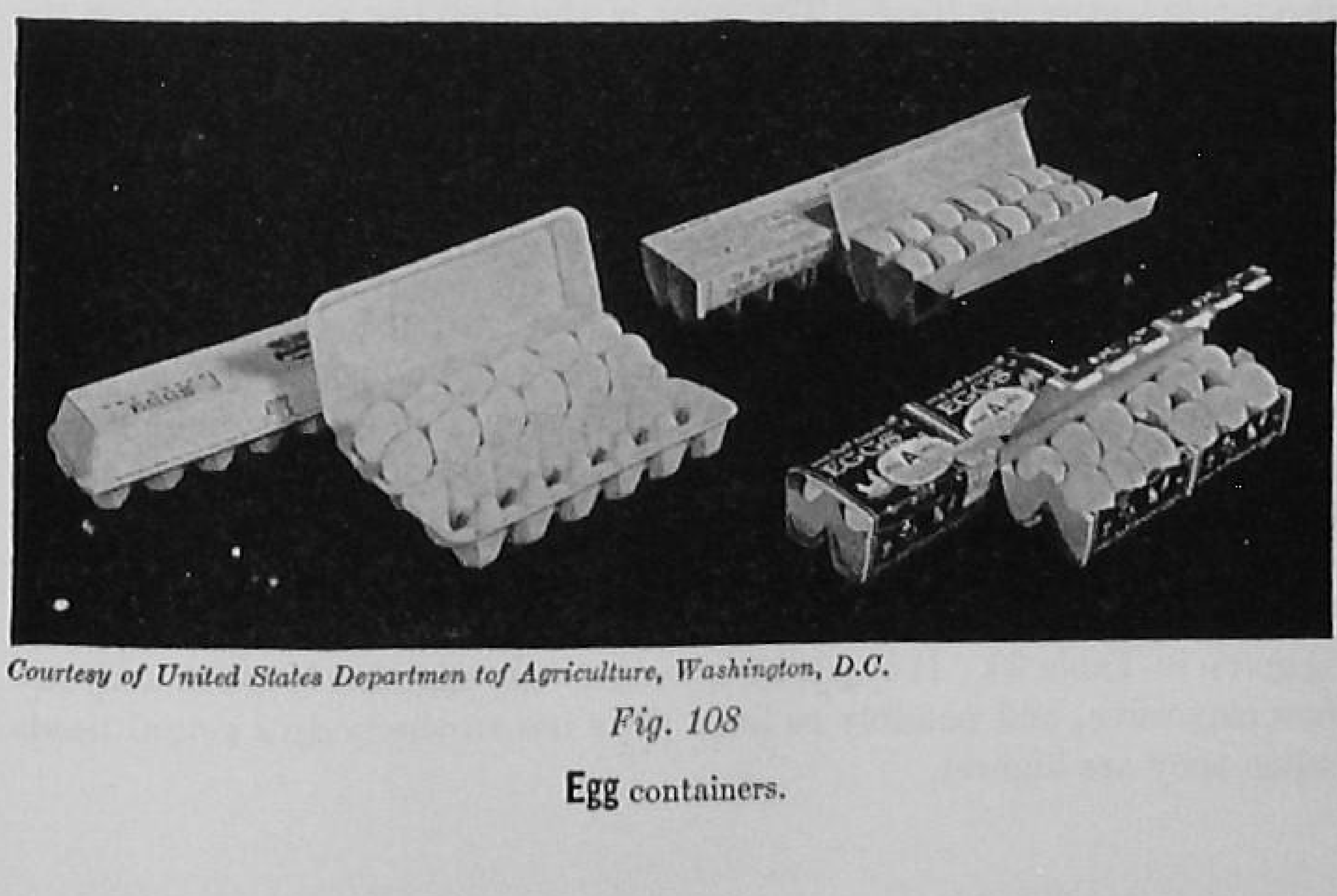


Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 107

Examples of shell egg grade marks.

Candling at this time is an important means of determining the grade of eggs. This process consists in holding and examining the egg against an electric light bulb in a dark room. Many characteristics of the egg's interior can be judged by this method. Practically all eggs that go through regular trade channels are candled. Many of them are candled a number



Courtesy of United States Departmen tof Agriculture, Washington, D.C.

Fig. 108

Egg containers.

of times: when they reach the country buying station, when they reach the city, and again when they are put into cartons for final sale.

Eggs are classed also by the United States Department of Agriculture according to size, based on weight. The six U.S. Weight Classes with their indicated weights per dozen are as follows: Jumbo (30 oz.); Extra Large (27 oz.); Large (24 oz.); Medium (21 oz.); Small (18 oz.); and Peewee (15 oz.). Only the Extra Large, Large, Medium and Small classes are usually found in retail markets. Grade and weight of eggs are determined separately so a number of combinations of the two are possible. All four grades may be represented in a given weight class.

The United States Department of Agriculture has a cooperative arrangement with State departments of agriculture that have adopted the Federal standards and grades for eggs whereby commercial firms may have their eggs graded under the Federal-State program. When this is done the egg containers bear the official shield mark that carries the letters, "U.S." and the words, "Federal-State Graded." The size of the eggs and the date of the grading are also included on the shield. The grading is done by licensed graders, trained and supervised by the United States Department of Agriculture. Many states are participants in this program.

Shape and color

The shape of an egg does not affect its grade unless the contour is extremely abnormal. However, eggs of uniform shape and smooth shell attract the purchaser, who frequently is willing to pay somewhat above the market price for them. The color of the shell has no effect upon the grade, although sectionally the sale may be influenced by it. Research has shown that brown and white eggs are equally desirable. Uniformity in color appeals to some purchasers.

Price

The price of eggs fluctuates widely throughout the year, due to seasonal production. As a result, eggs are likely to be inexpensive at a certain season and expensive at another. Storage of eggs has done much to equalize prices. The grade also determines the price paid, the higher ones being the more expensive. Though smaller eggs tend to be cheaper in price one should consider both grade and size as well as the use of the eggs when buying them. A comparison of prices of one grade of eggs with size is given in Table 63. It is good economy to use eggs freely when they are less expensive, and possibly to limit their use to the body's actual needs when they are highest.

TABLE 63. COMPARISON OF VALUES IN GRADE A EGGS, BASED ON MINIMUM WEIGHT OF FOUR SIZES*

When Extra Large Grade A Eggs (minimum weight 27 ounces per dozen) cost—	Large Grade A Eggs (minimum weight 24 ounces per dozen) are as good a value at—	And Medium Grade A Eggs (minimum weight 21 ounces per dozen) are as good a value at—	And Small Grade A Eggs (minimum weight 18 ounces per dozen) are as good a value at—
Cents per dozen	*Cents per dozen*	*Cents per dozen*	*Cents per dozen*
49	44	38	33
54	48	42	36
59	52	46	39
64	57	50	43
69	61	54	46
74	66	58	49
79	70	61	53
84	75	65	56
89	79	69	59
94	84	73	63

*Agricultural Marketing Service, Poultry Division, United States Department of Agriculture.

Amount to purchase

Unless there is a satisfactory place for storing them, eggs for family use should be purchased in rather small quantities. As eggs deteriorate quite rapidly, a purchase of not more than one week's supply at one time is suggested, even with a refrigerator for storage.

ACTIVITIES

1. Class name a committee to ascertain and report to the group the following information:
   (*a*) Extent to which U.S. graded eggs are offered for sale.
   (*b*) Grades of eggs available.
   (*c*) Market units by which eggs are sold.
   (*d*) Months when eggs are lowest in price, and why this is the case.
2. Ascertain the laws and regulations of your state for the sale and handling of eggs. Compare these with those recommended by the United States Department of Agriculture.
3. Estimate the quantity of eggs that must be purchased by your family each week to meet the Basic Seven recommendations. How may the cost vary at different times of the year?

PROBLEM 11 *How shall poultry be purchased?*

Poultry generally refers to the most used kinds — chickens, turkeys, ducks, geese, guineas, and squabs. All are considered choice foods, and in many homes and commercial eating places these have an important place in Sunday dinners and other special meals, as well as in everyday ones. Like meat, poultry provides the main dish of a meal around which the other foods are chosen. The numerous ways of preparing poultry make it an excellent means of giving a pleasing variety to all types of meals. Scientific breeding and feeding have produced poultry with flesh of superior quality and quantity. Inspection, grading, labeling, and packaging of the product, together with improved refrigeration in transportation and marketing have further enabled people to have poultry of high quality whenever desired.

Classes

Poultry may be purchased alive, dressed or ready-to-cook. Live poultry must be completely prepared for cooking after purchasing, usually by the homemaker. Dressed poultry has been killed, bled and picked, but the entrails, head and feet have not been removed. It is sold chilled or frozen. Ready-to-cook poultry has been eviscerated or fully drawn. All entrails, internal organs, head, feet, oil sac and pinfeathers have been removed and the bird thoroughly washed inside and out. The giblets and neck have been cleaned and wrapped, and put with the bird, often inside the cavity. Ready-to-cook poultry is sold whole or cut up, chilled or frozen, and packaged or not packaged. Most frozen poultry is quick frozen; that is, the poultry is first chilled and then rapidly frozen at temperatures of from −5° to −30° F. and then held at 0° F. or less.

Each of the different kinds of poultry have classes which are based upon age, sex, and weight. These are:

Chickens — Broilers or Fryers
Roasters
Capons
Stewing Chickens or Hens

Turkeys — Fryers or Roasters (under 14 weeks and sometimes sold as turkey broilers)

Young Hen Turkeys and Young Tom Turkeys — 6 to 8 months and the usual size for roasting
Hen Turkeys and Tom Turkeys — 10 months and older, and coarser meat

Ducks — Broiler or Fryer Ducklings
Roaster Ducklings
Mature (Old) Ducks

Geese and Guineas — Young
Mature (Old)

Squab — Squab
— Pigeons (Mature)

Though the meat yield from the younger birds is less than from the older ones, it is tenderer and juicier. Also it has a more delicate flavor.

Grades

An increasing amount of poultry for retail sale is graded according to the United States Standards. Much of it, however, is graded according to commercial standards, which are based on age, sex, weight, and type of poultry. Some of the poultry packers have developed their own grades. Such grades are often sold under brand names and are based either upon government standards or commercial standards or both. Graded poultry is so labeled. United States Standards have been developed for all of the commonly used kinds of dressed and ready-to-cook poultry. These are U.S. Grade A, U.S. Grade B, and U.S. Grade C. The grades are based,

Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 109

U.S. Inspection and grading stamps for poultry.

upon such qualities as appearance and texture; condition of skin; kind, condition, and amount of flesh; condition of legs; distribution of fat; and the general condition and cleanliness of the bird. Grades are formulated for the different classes of poultry and for each grade specific qualities are listed.

Voluntary grading and official inspection services for poultry are offered by the United States Department of Agriculture to commercial firms and processing plants. When such services are accepted the poultry may bear the official government grading and inspection labels, which may be a metal clip placed on the wing, or a paper tag or sticker placed somewhere on the bird, or the label information may be printed on the package. Only on ready-to-cook poultry may both grade and inspection labels be used, as dressed poultry can just be graded. Grading attests to the quality of the bird, while inspection insures its fitness for consumption. Both are highly important in the poultry purchased.

The poultry handled by large packers is usually sold under brand names that indicate their different grades. A practice sometimes employed by these firms is that of putting a blue label on the highest grade and a red one on the second highest.

Qualities desired

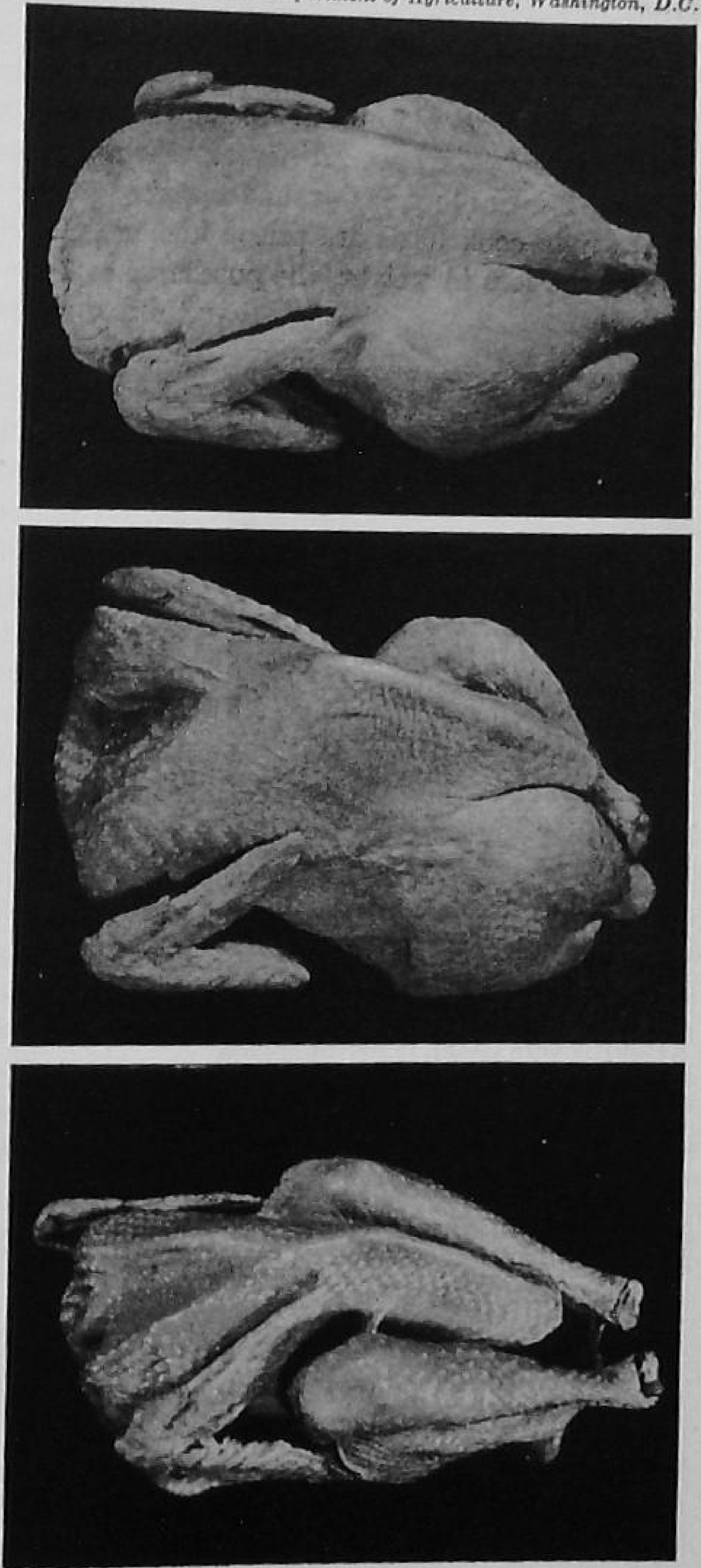
A choice dressed bird should have a compact body with plenty of flesh and fat, the breast well rounded, and the skin smooth and soft. The flesh should be pink or light in color, as dark meat indicates a stag condition. There may be pin feathers, but there should be no long hairs, as these indicate age. Old birds have stringy tough flesh; young birds have smooth legs, pliable toes and breast bone, and tender, compact flesh. All dressed and ready-to-cook poultry should be offered for sale from refrigerated cases.

Frozen poultry should be purchased in the frozen state. It should be kept in a special freezer case until it is sold. Most of the frozen poultry is the ready-to-cook type neatly packaged and labeled. All frozen poultry should carry an informative label and if a ready-to-cook product, should be inspected and graded.

A live fowl, to be a desirable purchase, should have a bright red comb, clean nostrils, no discharge from the mouth, clear eyes, smooth legs, smooth bright feathers, and plump and well-distributed flesh. A test for the age of the bird can be made by feeling the end of the breast bone. If the bone is hard and will not bend, the bird is old. Another test is feeling the muscle on the breast. Soft flesh indicates a young bird. The nape of the neck and the feather tracks are the parts to be examined for fat.

Fig. 110 **Three grades** of stewing chickens

Courtesy of United States Department of Agriculture, Washington, D.C.



U.S. GRADE A

Well fleshed, with full breast and "meaty" legs. No defects, such as crooked breastbone or broken bones. Good layer of fat well distributed under skin. Well-bled, well-picked, and free of pinfeathers. Skin has no tears or bruises.

U.S. GRADE B

Fairly well-fleshed, fair covering of fat. Fairly well-bled and fairly well-picked; no pinfeathers; no deformities or broken bones, no skin tears or bruises. (Minor deformities and minor tears or bruises are allowed.)

U.S. GRADE C

Poorly fleshed, poorly covered with fat. (Could also have been poorly bled, poorly picked; could have had minor skin tears or bruises, some deformities, or a broken bone, as these defects are allowed.)

Price

The price of poultry varies widely during the year, although, as with eggs, cold storage has helped to equalize it. Young birds are considered more choice than old ones; consequently they command a higher price. Old birds, however, are satisfactory for soups, loaves, and combination dishes. For broiling, frying, and roasting, younger birds should be used.

Ready-to-cook birds are priced higher than dressed ones. However, due to the loss in weight, the purchaser can afford to pay at least one-third more per pound for ready-to-cook broiler or fryer chickens, and at least one-fourth more for larger chickens, and at least one-fifth more for large turkeys of this type. Packaged frozen poultry that is ready-to-cook is in the higher price range, but it has many qualities and advantages for which the consumer may wish to pay. In some markets, pieces of chicken — as breasts, giblets, legs, livers, and wings — may be purchased in amounts as desired. The price is higher when poultry is purchased this way, especially for the choice pieces. Frozen half and quarter turkeys are also on the market, and frozen cut-up turkeys are also available. Small turkeys are gaining in popularity, especially with small families. In some localities turkey steaks and filets are on the market. These are most always frozen products and are more or less in the luxury class. In any event, the selection and purchase of poultry should be made in relation to the intended use and to the food budget.

Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 111

A ready-to-cook turkey, inspected, graded, and packaged.

Amount to purchase

The quantity of poultry to purchase for a given meal is estimated after taking into consideration the method of preparation and the number of persons to be served. Other factors involved, too, are the size, age, and fatness of the bird, and the size of servings. Generally speaking a two-pound broiler, either dressed or ready-to-cook, serves from two to four

persons. For frying and roasting three-fourths of a pound or one pound of dressed chicken per person is the usual allowance, and two-thirds to three-fourths of a pound of ready-to-cook chicken. Cafés and restaurants order on the basis of eight servings from a four-pound roaster. For combination dishes, such as chicken à la king, creamed chicken and chicken pie, one-third of a pound of dressed stewing chicken, or one-fourth of a pound of ready-to-cook stewing chicken is allowed per person. A five-pound chicken, dressed weight, yields about four cups of solid meat; a ready-to-cook chicken of the same weight yields about five cups. From the dressed chicken ten to twelve servings of creamed chicken can be prepared, and from the other, twelve to fifteen. Birds vary in the amount of meat on them, the broad breast type having the most. As a rule the very young, the extremely small and extremely fat birds yield less meat proportionally than do other birds. For roasting or baking, the seven- to ten-pound ready-to-cook turkey is generally considered an economical size for home use. Recipes and the labels on packaged poultry often indicate the amount to purchase. A good practice is to keep a record of the amount purchased to serve groups of various sizes and to indicate on the recipes used the size of bird as well as the number that were served. Records of this type aid materially in future marketing.

ACTIVITIES

1. Class appoint several committees to find out and report to the class the following for your community:
   (*a*) The extent to which U.S. inspected and graded poultry is sold.
   (*b*) Which type of poultry — live, dressed or ready-to-cook is the most purchased.
   (*c*) Whether poultry is an expensive or inexpensive food.
   (*d*) How the various kinds of poultry vary in price.
2. Decide the best ways to select and purchase poultry and give reasons for your choices.
3. A dressed turkey weighing eighteen pounds is priced at fifty-five cents per pound. At what price per pound can you afford to pay for a ready-to-cook bird that originally was the same size?
4. A woman preparing food for a party desires eighteen pounds of chicken for scalloped chicken. Chickens four to five pounds in weight are selling for eight cents per pound more than chickens weighing six to seven pounds. Which should be her choice? Why? How many birds should she purchase in each case? In what form should she purchase them?

PROBLEM 12 *How shall meat and fish be purchased?*

Meat

Meat is a popular and enjoyable food in the diets of American people and a desirable one from the standpoint of nutrition. If the nutritional standard of meat once each day is to be met in many families, careful planning of the food expenditures and wise selection are necessary.

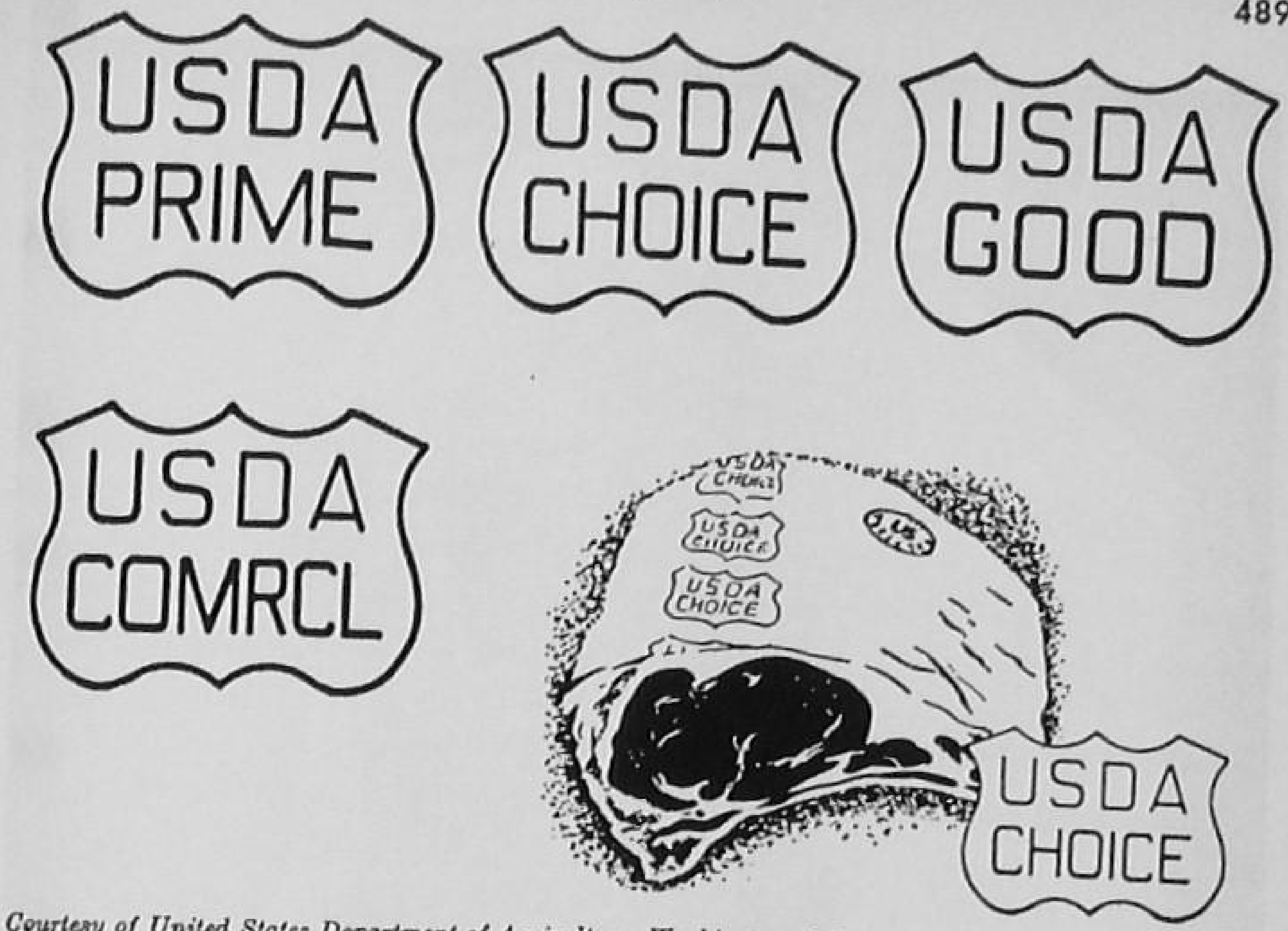
United States regulations and grades

The United States Department of Agriculture has set up for the packing houses engaged in interstate trade specific standards and regulations regarding the type and condition of animals slaughtered and the care given the meat afterward. All meat destined for interstate trade must be inspected by the United States Government inspectors and must meet stipulated standards before it can be sold. Sick or diseased animals may not be used for food. To indicate that the meat is approved for selling, a blue stamp of harmless coloring is placed upon it. This assures the purchaser that the meat was produced and prepared for market under safe and healthful conditions. However, this Federal inspection does not apply to meat produced and sold within a state. State and city regulations govern in that case. Nevertheless, a large percentage of all meat sold is government inspected.

The government also has established grades for the meats most commonly used. These grades are determined by conformation, finish, and quality, which includes such characteristics of the meat as tenderness, flavor, amount of fat, juiciness, and color.

Beef is graded as U.S. Prime, U.S. Choice, U.S. Good, U.S. Standard, U.S. Commercial and U.S. Utility. There are two other grades — U.S. Cutter, and U.S. Canner — but these classifications are used mostly in manufacturing and are practically never found in the retail market.

The flesh in the better grades of beef is a bright cherry red, elastic and firm to the touch, fine-grained, smooth and velvety, well marbled and coated with fat of a white or cream color; it has a pleasant odor. In the lower



Courtesy of United States Department of Agriculture, Washington, D.C.

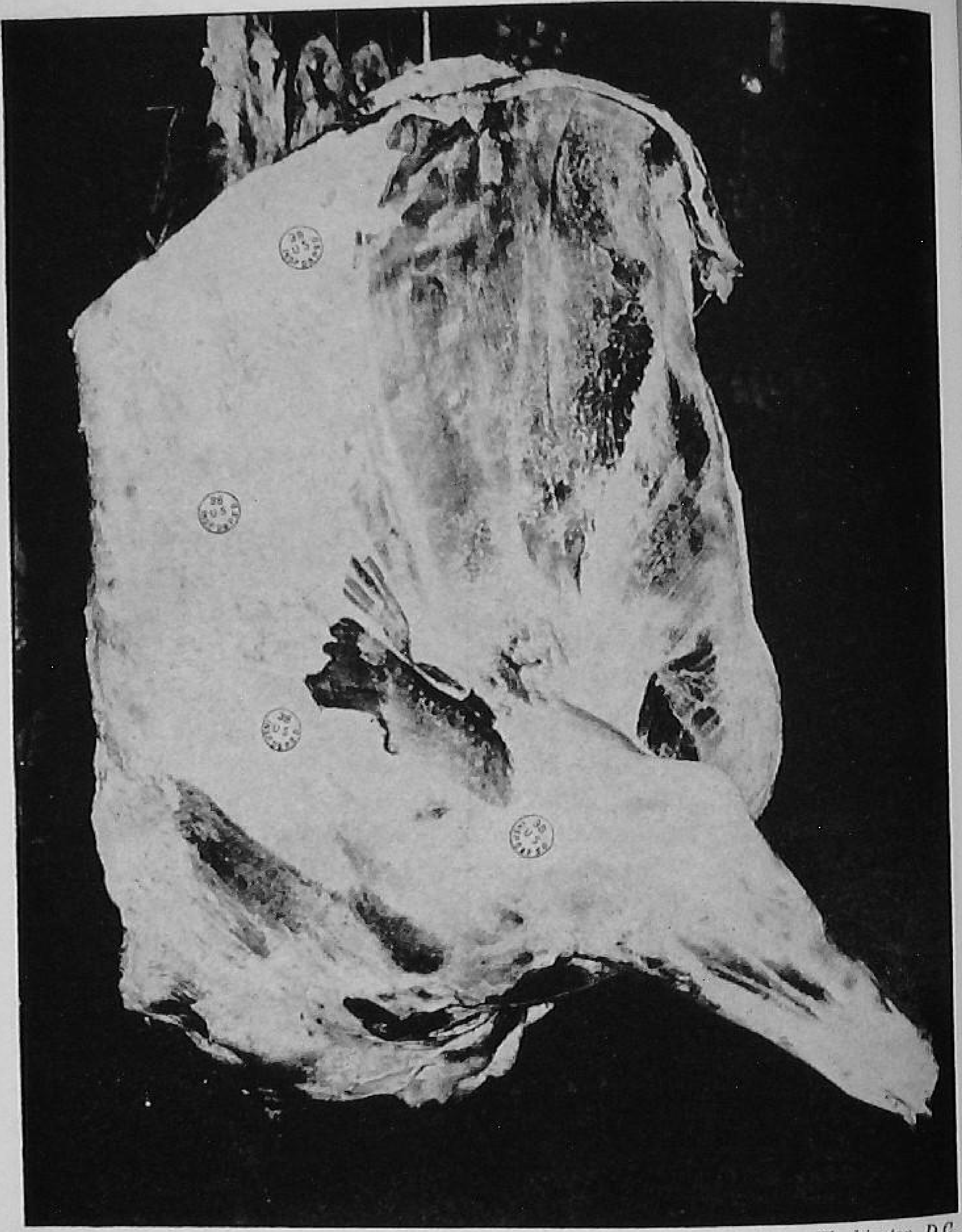
Fig. 112

U.S. graded cut of meat.

grades it is medium to dark red in color, coarse-grained, deficient in fat, with little or no marbling. The fat may be soft, flabby, yellow, and unevenly distributed. The flesh is usually tough, and the bones may be hard, white, and flinty. U.S. Prime is the highest grade, and is of such excellent quality that the beef from only about 1 per cent of all the cattle comes within this grade. U.S. Choice and U.S. Good are the highest grades generally found in retail markets.

The grades of veal are U.S. Prime, U.S. Choice, U.S. Good, U.S. Commercial, and U.S. Utility. There is still a lower grade, U.S. Cull but it is not sold in the retail market. The better grades of veal are those in which the flesh is fine-grained, light pink in color, somewhat firm, moist, and velvety to the touch. There is some fat present, which is white and brittle. The bones of veal are soft, red, and small. In the poorer grades, the flesh is soft, coarse-grained, and moist to the touch, a pinkish-brown to dark tan or reddish-brown in color, with a small amount of fat. The fat is tinged with yellow, and the bones are large and lack redness.

The grades of mutton and lamb are the same as those of veal. Mutton comes from the older animals, those over 12 months old; lamb from those

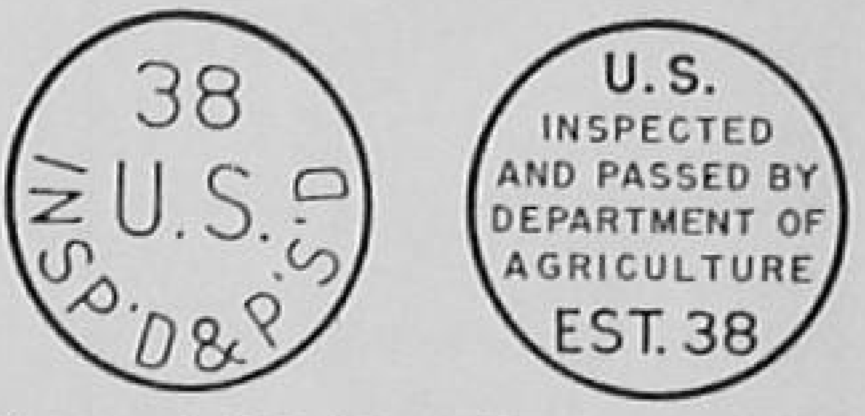


Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 113

Quarter of beef showing U.S. inspection stamps.

12 months old or less. The flesh of mutton is firmer and deeper in color than lamb, but in the better grades both are fine-grained, firm, and reddish-pink in color. The fat of mutton is white and firm. Lamb fat is less hard than mutton fat and is creamy and slightly pinkish in color. In good mutton or lamb the carcass is covered with a layer of firm fat. Fat is also found around the kidneys. In the poorer grades of mutton and lamb, the flesh is darker red in color, dry, coarse, and less tender and palatable, and the fat is soft. In some cases there is too much fat and in others too little. Poor mutton may have an odor that is not pleasant. Only a small amount of mutton is sold.



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 114

U.S. Inspection stamp for meat.

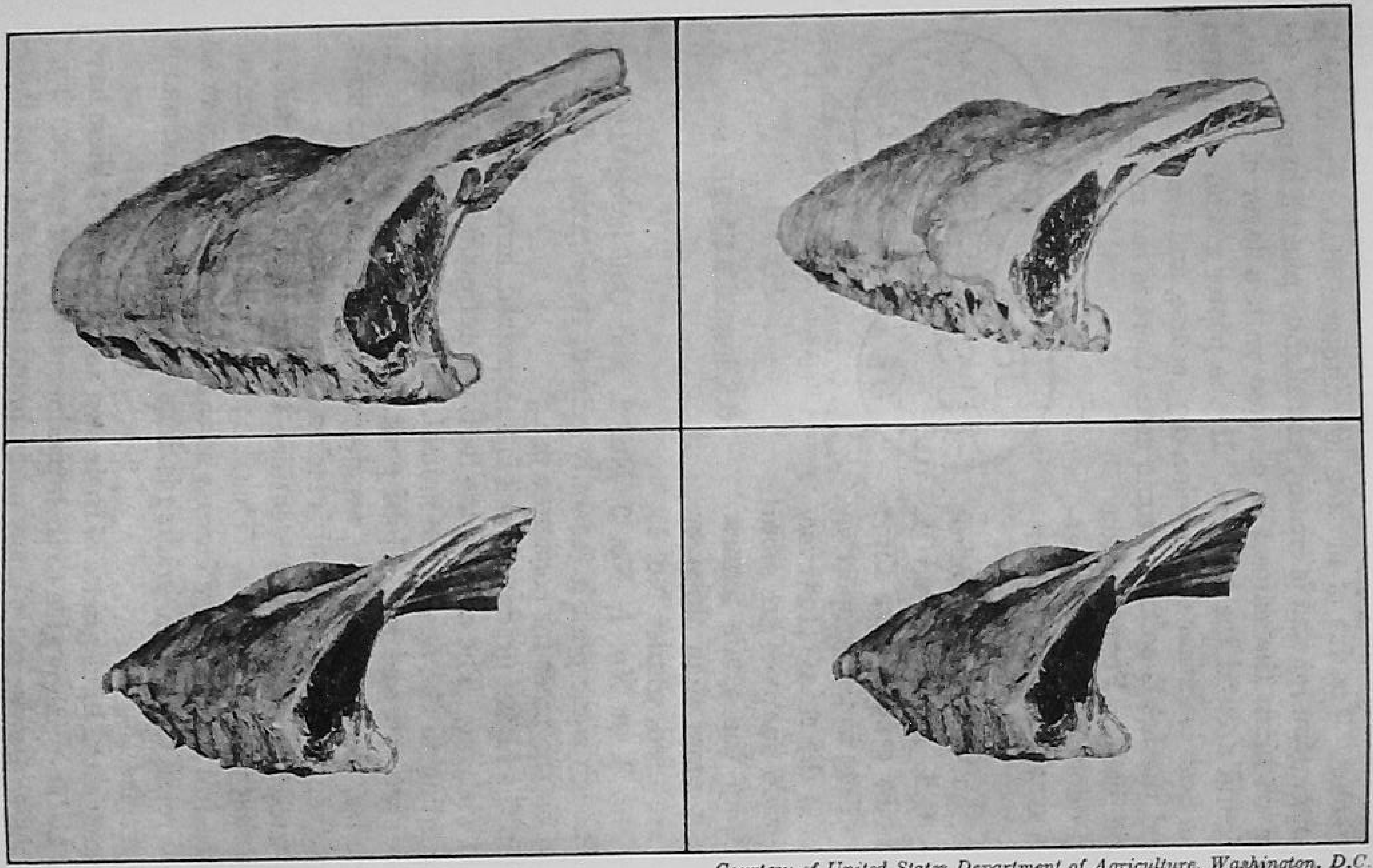
Pork has the following grades: U.S. Choice, U.S. Medium, and U. S. Cull. Choice grades have three divisions according to the proportion of lean to fat in the cuts. However, in pork the grade numbers are more often used than the grade names. As a rule, not more than three or four grades are used, grades No. 1, No. 2, and No. 3, or No. 1, No. 2, No. 3, and Cull being the most common. Though some pork is federally graded, these grade marks are not indicated on the meat for consumer use.

The flesh in the higher grades of pork is fine-grained, firm, velvety, and well marbled with fat. The color of the flesh varies from white to a grayish pink according to the age of the animal. The fat is white and firm, and the bones are soft and red. Good pork has practically no odor. In the lower grades, the flesh is coarse, rough-grained, and dark red in color. The fat is unevenly distributed and is lacking in firmness.

Federally graded meat may be identified because it is marked with a shield containing the grade name. This is done by roller with a harmless purple ink the full length of the carcass so that the grade appears on all of the graded retail cuts. The grading is done after the inspection and is an optional service.

Meat packers often have grades of their own and for each of these have special names. These they give to their products instead of grades. This means that the consumer must know many brand names and what these stand for in making intelligent meat purchases.

U.S. graded meat was first offered to retail markets in 1927 on a vol-



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 115

Grades of beef ribs, as may be noted in the picture, are, from left to right: choice, good, medium, and common. The covering of fat, marbling of lean, and shape of cut are all evidences of the differences in quality.

untary basis. That is, dealers could handle this graded meat as they desired. However, the United States Department of Agriculture recommended that all packers grade meat for the retail market and offered a grading service to dealers. By 1941, with the exception of pork, approximately 10 per cent of the meat sold in commercial markets was U.S. graded and stamped. A few cities even passed and enforced ordinances requiring the sale of graded meat only. From July, 1942, until October, 1946, the grading of meat according to the United States Government standards was put on a compulsory basis throughout the nation as an emergency measure. During this time everyone had the advantage of buying U.S. graded meat. There is much evidence that consumers prefer buying meat of this type. Consumers can help to bring back the universal grading of meat in this country by making it a practice to ask for graded meat when they buy.

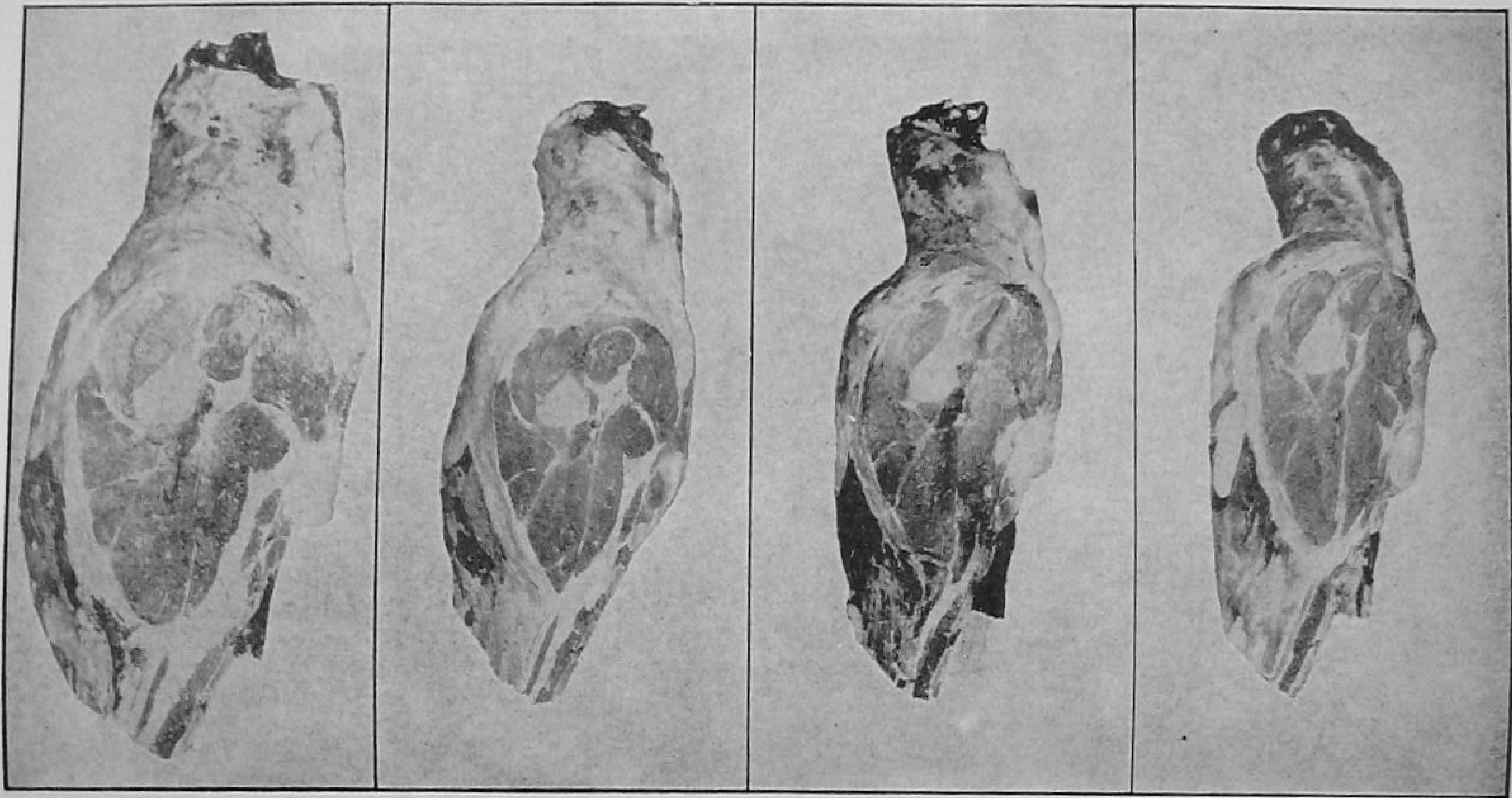
The higher grades of meat, of course, are more expensive than the lower grades. Some people, believing that only the highest grades should be purchased, buy the best grade that they can afford. Such practice should not be followed without some deviation. The lower grades of meat are not lacking in food value, and if suitable methods of cookery are employed, pleasing and appetizing dishes can be made from them. The recipe selected and the method of preparation should influence the grade to be purchased.

Cuts

In buying meat, the choice of cut is important. Whether a tender or less tender cut is chosen should be determined by the method to be used in cooking it, the price, and the amount of money available for its purchase. Usually the tender cuts are more expensive than the less tender, but this difference in price varies according to locality. When there is a choice between two cuts, one of which is more expensive than the other, the total cost should be considered: the cost of the fuel that will be required and of any waste in preparation should be added to the original cost of the meat. It may be that the tender cut will prove the less expensive purchase in the end. A less expensive cut from a high-grade carcass is to be preferred to the best cuts from a low-grade animal. Frozen meat is now on the retail market, and various cuts are available in this form. However, the names vary somewhat from those in common use for cuts of meat, and have not yet become standardized.

Waste

The amount of waste or inedible portion is an important item to con-



Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 116

Grades of beef chuck are shown here. From left to right these are: choice, good, medium, common. The differences in quality are especially evident in the shape of the neck and the marbling of the lean with the fat.

sider when selecting meat. If a cut has much bone, connective tissue, and gristle, it may be an expensive purchase even though the price per pound is low. Meat that has much fat is undesirable for some purposes, such as for meat loaf and hamburger. The inedible portion in meat is generally not given much consideration. However, a study of the subject showed that the waste in yearling beef carcasses is high. The average waste was found to be 44.21 per cent, the range among the various cuts being from 9.09 to 75.97 per cent. The cut having the greatest percentage of waste was the flank, with the fore shank and plate second and third respectively. The cut having least waste was the upper buttock or upper round, with cross arm and chuck No. 2 ranking second and third respectively. Loin was found to have a waste of 45.25 per cent, and chuck No. 1, 31.51 per cent. Shrinkage in cooking also is an important consideration. This same study revealed the average was 16.99 per cent, the range being from 4.12 per cent to 29.35 per cent. The least shrinkage was in the flank and fore shank cuts, and the greatest in the cross arm and chuck No. 2 cuts. When the shrinkage in cooking is added to the inedible waste, the meat available for serving is greatly reduced, as is shown in Table 64.

Table 64. MEAT AVAILABLE FROM VARIOUS CUTS OF BEEF AFTER COOKING. PERCENTAGES AND NUMBER OF SERVINGS BASED ON WEIGHT OF MEAT AS PURCHASED

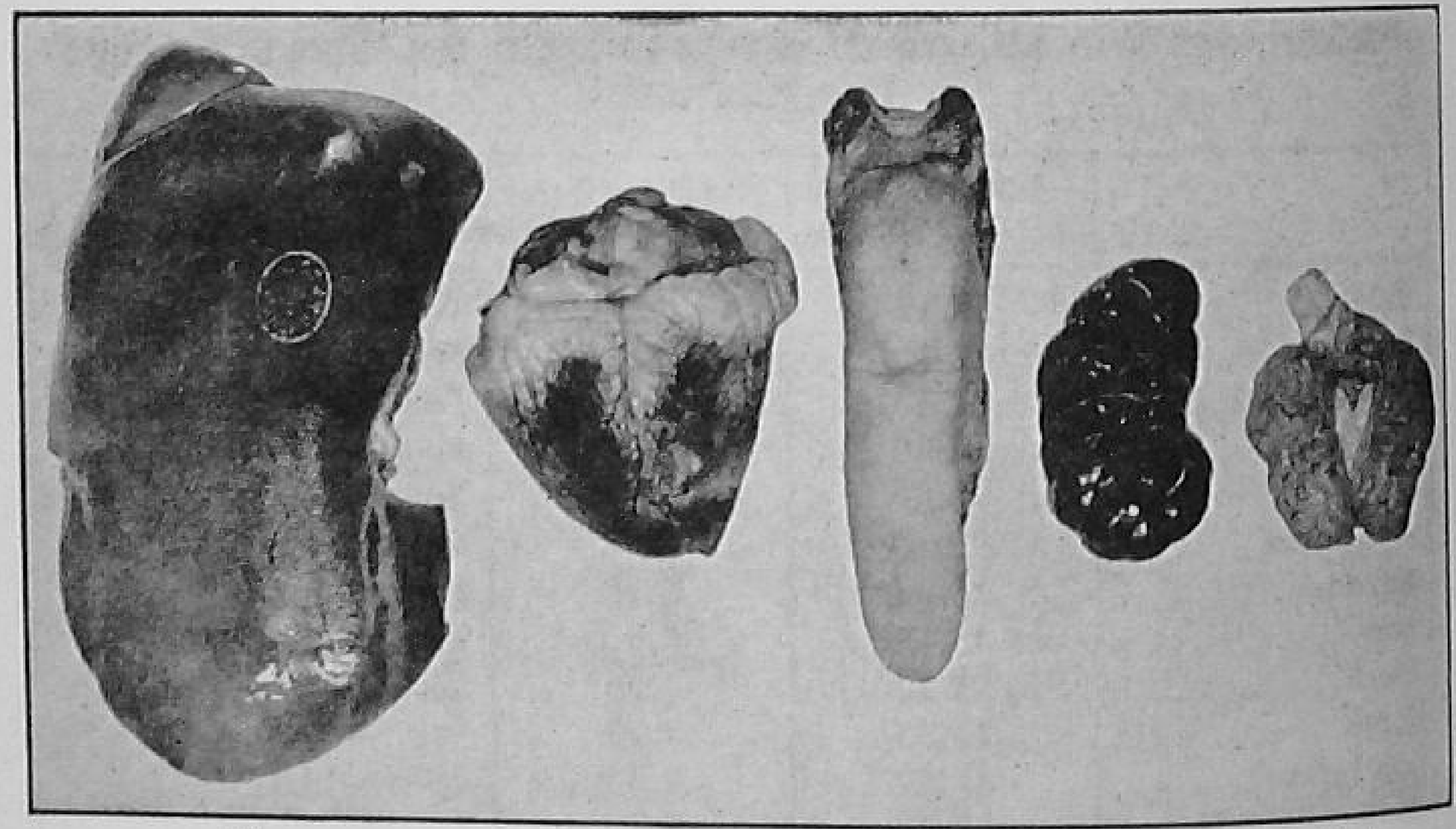
	Percentage Available for Serving	Number of Servings per Pound	Quality of Serving
Brisket	39.18	2.61	Good slices
Chuck No. 1	46.85	2.66	Fair slices
Chuck No. 2	47.56	3.15	Fair slices
Cross arm	46.60	3.05	Poor and few slices
Flank	20.02	1.07	Poor slices
Fore shank	26.46	1.28	Chunky, contained gristle
Knuckle	35.44	2.16	Poor
Loin	45.17	2.86	Excellent
Neck	35.20	1.86	Slices fair, but tough
Plate	23.65	1.29	Fair, chunky
Rib (prime)	47.52	2.74	Excellent slices
Round, inner	67.74	3.30	Excellent steaks
Round, lower	25.62	1.54	Good slices
Rump	34.43	2.69	Fair
Shoulder	39.81	2.57	Fair
Average	38.80	2.32	

Amount of purchase

The amount of meat to purchase for serving a group cannot be stated exactly. Various factors enter into the estimate of the quantity needed, as the cut purchased, the method of preparation, the frequency or regularity with which meat is served, and the group's liking for meat. A rule frequently given is to allow from one quarter to one half pound, as purchased, per person, per meal. But there are exceptions to this, as cuts vary in the amount of servings yielded. It has been found that inner round, chuck No. 2, and cross arm yield slightly over 3 servings per pound as purchased; loin, rump, and chuck No. 1, slightly over 2½ servings; plate, fore shank, and flank, slightly over 1 (see Table 64). The quantity of the meat purchased at one time should be determined in relation to the refrigeration and freezer facilities, as meat has limited keeping qualities.

Sundry edible parts

There are sundry edible parts of meat animals that are becoming increasingly popular as food. They are called by various names such as variety meats, fancy meats, miscellaneous products, and edible organs. These include brains, heart, tongue, liver, sweetbreads, kidneys, and



Liver Heart Tongue Kidney Brain

Courtesy of Armour and Company

Fig. 117

Variety meats.

ears. Many of them are valued highly for their special nutritional contribution to the diet. Their delightful and interesting flavors cause some of them to be regarded as delicacies.

Sometimes these edible organs may be purchased at a low price, and sometimes they are extremely high in price, depending upon the locality and the demand for a particular organ or part. It may be possible in one community to purchase a large tongue for fifty cents, whereas in another community the price may be as much as two dollars. Calves' liver may be preferred in one market and hogs' liver in another, and the price usually corresponds to the demand.

The amount to purchase of any of these variety meats depends upon the number of persons to be served, the recipe to be used, the method of preparation to be followed, and of course the size of the organ. The size of these, of course, is determined by the animal from which they were taken. The weights for some of the most used parts are: brains, ¼ pound to 1 pound; heart, ¼ pound to 5 pounds; kidneys, 2 ounces to 1 pound; liver, ¾ pound to 14 pounds; sweetbreads, ½ pound to 1 pound; tongue, ¼ pound to 4 pounds. In some cases, the entire organ must be purchased, as a heart, tongue, or kidney. In others, as liver, brains, and sweetbreads, any amount may be purchased. Sweetbreads are sometimes sold singly or by the pair. There is little waste, as a rule, in the preparation of the sundry edible organs.

In selecting these variety meats, care should be taken that the product chosen is fresh and in good condition, for these parts of the animal spoil rapidly. An off color, or peculiar odor or condition that deviates from that usual for the organ, should cause it to be regarded with caution, and in all probability it should not be purchased.

Cured and canned meats

Among the common cured or smoked meats found on the market are sausage, bacon, and ham. There are two main classes of sausage: fresh, which includes fresh pork sausage, frankfurters, and bologna; and dry or summer, which includes cervelats and salamis. Fresh pork sausage may be purchased in bulk, in links or patties, and in one- or two-pound cloth-encased rolls. There is no constant relationship between the form in which the product is marketed and the grade. If purchased in bulk, the proportion of fat to lean should be noted to make sure that sausage with an excessively high proportion of fat is not purchased. Most of the fresh pork sausage, frankfurters, and bologna on the market come from the large meat-packing plants and are packaged and sold by brand.

Courtesy of Armour and Company

Fig. 118

The available canned meats are surprisingly numerous.

Bacon, both pork and beef, should be firm, and well streaked with lean. It is usually purchased in slices and packaged. The bacon that is well striped with lean commands the higher price. Canadian-style bacon is a lean type of bacon that is the top of the pork loin rolled, cured, and smoked. It is more expensive per pound than bacon but there is no waste and one pound serves four to six people. All types of bacon, unless home cured, are most always purchased by brand.

Ham is considered the choicest of the cured meats. It can be purchased whole or by the slice. The center slices are preferred and are the highest in price. The shank and butt are the end cuts of the ham and are less expensive than the center cut. This meat keeps well if properly refrigerated, a ten- or twelve-pound ham often being an economical purchase for a family of six or more. The term "tender" or "tenderized" on the label of a ham means that it has been specially treated so that it requires less time to cook than does a regular cured ham. Precooked ham may also be purchased.

There is available a less expensive cured meat, known as picnic. It is cured shoulder and is a tasty product but less expensive than ham. A boneless cured shoulder butt is also available.

Cured meats are purchased by brand. Some companies have several grades of a product with a brand name for each. However, for these and other manufactured meat products, the government has a grading service which considers such qualities as aroma, color, composition, condition, firmness, flavor, texture, and uniformity. In this grading there is only one grade, U.S. No. 1. The product must come up to this standard in every respect if it is to be stamped with the mark — "Certificate of Quality, U.S. No. 1 Grade." As a rule, cured meats are more expensive than fresh meats. This is especially true of cured pork products. By experimental purchasing one may determine the brand that best suits the group to be served with the money available.

A wide variety of canned meat products are on the market and include such items as Vienna sausage, corned beef, luncheon meat, deviled ham, meat balls, beef stew, beef ravioli, chipped beef, and various meat spreads. Many are mixtures of several kinds of meat, or of meat from different parts of a carcass. Most canned meats have been thoroughly sterilized in the canning process, and are treated as any other canned food. Certain meats as some cured or smoked hams are cooked and canned for short-time keeping by refrigeration. Canned meats should always have on their label the United States Government inspection stamp. Canned meats are purchased by brand. They, too, are more expensive than fresh meats, but are often convenient for occasional and special uses.

Prepackaging

Retail markets in most localities have prepackaged meats for sale. These are especially desirable in self-service places though other grocery stores handle such products too. The packaging is such that the contents can be easily seen and a descriptive or informative label is on the outside.

If the meat has been Federally inspected and graded, this is also indicated by the official stamps. Prepackaged meat is gaining in favor and more varieties are appearing all of the time in this form including fresh, frozen, smoked or cured, and cooked meats.

Fish

Fish has a less extensive place in the diet of the American people than does meat, the consumption of fish being only one tenth that of meat. Its use is greater in the coast, river, and lake regions. Certain kinds are peculiar to each region. The species and varieties are numerous, and both large and small fish are eaten. Among the most commonly used kinds are salmon, trout, halibut, cod, catfish, mackerel, and the shellfish: oyster, shrimp, crab, lobster, and scallops.

Fish is available in the market as fresh, frozen, canned, and cured. Fresh fish and frozen fish are graded by the industry for quality and size. The size grades, though numerous, are less important than the quality grades, which rank fish as Fancy, Good Quality, Off Quality, and Unfit for Food. Both the standards of these grades and the methods of enforcing them are very far from being uniform. For most fishery products there are no informative federal grades. Minnesota and Virginia have compulsory grading laws for certain fishery products sold within the states. Most states have strict laws regarding the size of fish that can be taken from state waters for commercial purposes.

In fish of good quality, the color and skin are bright, and the scales adhere well. The eyes are clear and unsunken. The gills are red like fresh blood. The flesh is firm and elastic and has an odor of freshness. There is little slime on the skin, and the body is stiff. As a rule, if placed in water, the fish will sink. In fish of off or low quality the skin is dull, slimy, and pale in color. The scales are loose, and the eyes gray and dull. The gills are dark or pale, the flesh flabby and soft, and an impression made with the finger remains. The odor is stale or even sour, and the body limp. Usually, when placed in water the fish will float. Fresh fish is on the market as round, drawn, dressed, pan-dressed, fillets, sticks, and steaks. Round fish are whole undressed fish as they come from the water. Drawn fish are those that have only the entrails and gills removed. Pan-dressed fish have the scales, fins, head, tail and entrails removed and possibly the bones and skin. Fillets are pieces free of bone cut lengthwise from the sides of the fish, close to the backbone. These may be single or

double (butterfly, two single fillets held together by uncut flesh). Sticks are lengthwise or crosswise cuts from fillets and are of uniform thickness and length. Steaks are pieces about one inch thick, cut crosswise from large whole fish.

Oysters are the most important of the shellfish, with shrimp and crabs next. The season for oysters begins in September and October, and lasts through the winter months. Oysters are often named according to the waters from which they are taken, for instance, Cotuits, Blue Points, and Lynhavens. There is a tendency to use these designations as trade names for oysters of the same shape and size, even though their source is different. The oyster industry has set up for some of their products the size names listed in Table 65, and containers are supposed to be marked with these terms. For others there are as yet no size standards. An oyster of good quality is plump, thick-meated, firm, and white, and its gills or mantles are thick. The four- or five-year-old oysters are considered the most desirable in size, but small ones are often used. On oyster containers distributed on the Pacific Coast the following grade names are generally used: A, 40 to 64 per gallon; B, 65 to 80 per gallon; C, 81 to 96 per gallon; D, 97 to 120 per gallon; E, 121 to 144 per gallon, and F, over 144 per gallon.

The regulation of the oyster industry is such that the highest and strictest sanitary conditions of production are unquestionably assured.

TABLE 65. SIZE NAMES FOR OYSTERS

Type of Oyster	Size 1 (largest)	Size 2	Size 3	Size 4 (smallest)
Atlantic, shelled......	Counts	Extra Selects	Selects	Standards
Pacific, shelled.......	Extra large	Large	Medium	Small
Atlantic, unshelled....	Large	Medium	Half Shell	Small

Size names have also been agreed upon by the crab industry. Hard crabs cooked or alive are graded as Jumbo (Size 1, the largest) and Hard Crabs (ungraded); Soft Crabs cooked or alive are graded as Jumbo Prime (Size 1) Prime (Size 2), Hotel Prime (Size 3), and Medium (Size 4). Shedder or peeler crabs are graded as Prime (Size 1) and Medium (Size 2). Fresh boiled crab meat is divided into four grades, according to the quality of the meat: claw meat (first), white meat (second), special lump meat (third), and back fin (fourth).

TABLE 66. PURCHASING GUIDE FOR FISH AND SHELLFISH *

Species	Fat or Lean	Usual Market Forms	Principal Areas Where Available
Salt Water:			
Bluefish	Lean	Whole and drawn	Middle and South Atlantic
Butterfish	Fat	Whole and dressed	North and Middle Atlantic
Cod	Lean	Drawn, dressed, steaks, fillets	Entire United States
Croaker	Lean	Whole, dressed, and fillets	Middle and South Atlantic; Gulf
Flounder	Lean	Whole, dressed, and fillets	Entire United States
Grouper	Lean	Whole, drawn, dressed, steaks, and fillets	South Atlantic; Gulf
Haddock	Lean	Drawn and fillets	Entire United States
Hake	Lean	Whole, drawn, dressed, and fillets	North and Middle Atlantic; Midwest
Halibut	Lean	Dressed and steaks	Entire United States
Herring, sea	Fat	Whole	North Atlantic; Pacific
Lingcod	Lean	Dressed, steaks and fillets	Pacific
Mackerel	Fat	Whole, drawn, and fillets	North and Middle Atlantic; California
Mullet	Lean	Whole	Middle and South Atlantic; Gulf; Midwest
Pollock	Lean	Drawn, dressed, steaks, and fillets	Entire United States except Pacific
Rockfish	Lean	Dressed and fillets	Pacific and Midwest; Gulf
Rosefish	Lean	Fillets	Entire United States
Salmon	Fat	Drawn, dressed, steaks, fillets	Entire United States
Scup (Porgy)	Lean	Whole and dressed	Middle and South Atlantic
Sea Bass	Lean	Whole, dressed, and fillets	Middle and South Atlantic; Pacific
Sea Trout	Lean	Whole, drawn, dressed, and fillets	Middle and South Atlantic; Gulf
Shad	Fat	Whole, drawn, and fillets	North, Middle and South Atlantic; Pacific
Snapper, red	Lean	Drawn, dressed, steaks and fillets	Middle and South Atlantic; Gulf
Spanish mackerel	Fat	Whole, drawn, dressed and fillets	Middle and South Atlantic; Gulf
Spot	Lean	Whole and dressed	Middle and South Atlantic
Whiting	Lean	Whole, drawn, dressed and fillets	Entire United States except Pacific

* National Fisheries Institute.

TABLE 66. (continued)

Fresh Water:			
Buffalofish	Lean	Whole, drawn, dressed and steaks	Midwest
Carp	Lean	Whole and fillets	Midwest; Middle Atlantic
Catfish	Fat	Whole, dressed and skinned	Middle and South Atlantic; Midwest; Gulf
Lake herring	Lean	Whole, drawn, and fillets	Midwest
Lake trout	Fat	Drawn, dressed and fillets	Midwest
Sheepshead	Lean	Whole, drawn, dressed and fillets	Midwest
Suckers	Lean	Whole, drawn, dressed and fillets	Midwest
Whitefish	Fat	Whole, drawn, dressed and fillets	Midwest
Yellow perch	Lean	Whole and fillets	Midwest
Yellow pike	Lean	Whole, dressed and fillets	Midwest
Shellfish:			
Clams	Lean	In the shell, shucked	Entire United States
Crabs	Lean	Live, and cooked meat	Entire United States except Midwest
Lobsters	Lean	Live, and cooked meat	North and Middle Atlantic; Midwest
Oysters	Lean	In the shell, and shucked	Entire United States
Shrimp	Lean	Headless, and cooked meat	Entire United States
Scallops	Lean	Shucked and cleaned	Entire United States

Fig. 119

Fish sticks and fillets make attractive, appetizing, and easy-to-prepare main dishes for luncheon and dinner.

Courtesy of National Fisheries Institute

Shrimp on the Atlantic and Gulf Coast are designated, according to size, as Jumbo, under 25 per pound; Large, 25–30 per pound; Large Medium, 28–30 per pound; Medium, 30–35 per pound; and Small, 35 and over per pound. The three varieties are white or pearly gray-green, brown or grooved, and pink or coral. They are sold with heads removed. A clean parchment-like covering that fits close to the body is an indication of quality.

Lobsters are purchased according to size, which varies from three-fourths of a pound to over two and one-half pounds. They are of a brownish or bluish green color which turns red when cooked.

Scallops are a creamy white color and are of two varieties: small bay and large sea scallops. The more tender and delicately flavored are the smaller bay ones.

Because of its poor keeping qualities, fresh fish is best preserved by freezing. Much fish on the market is quick frozen. Frozen fish is both bulk frozen and frozen in the package. The latter is fast gaining in favor over the bulk frozen and especially the drawn fish. Both frozen pre-

cooked fish and frozen ready-to-cook fish are available in retail markets. Among the favorites are ready-to-cook breaded shrimp and fish sticks.

Amount to purchase

Fresh fish, with few exceptions, is relatively inexpensive in many localities. Since much of the fish on the market has been frozen, the purchase of fish in amounts sufficient for more than one day's needs is precluded unless there are home storage facilities for frozen foods. As is the case with meat, the type of fish chosen determines to some extent the amount to purchase. The small fish have a greater percentage of inedible material than do the large. Fillets, steaks, and sticks, though they may cost more per pound, have no waste. A pound of any one of these yields three to four servings. With frozen fish sticks the number of servings is indicated on the package.

Cured and canned fish

Smoked or salted fish is the least expensive type of fish and is on the market either in package or in bulk form. The package commands the higher price. Packaged cured fish is usually marketed under a brand or trade name. The kinds of fish most commonly sold in cured conditions are herring, mackerel, cod, and haddock.

Much canned fish is purchased for family consumption in this country. It offers a convenient way of adding variety and pleasing, essential foods to the diet. Though many different kinds of fish are canned, the most common ones are salmon, tuna, shrimp, sardines, crab, and oysters. Canned fish is purchased mostly by brand and by the information on the label, which should give the purchaser the needed facts concerning the product. For example, for some fish, as salmon, the variety or species is an important consideration, and should be stated on the label. For tuna, the color and size of the pieces of meat, and whether packed in oil or brine should be known. In the case of shrimp, the size of the shrimp and the type of pack, wet or dry, should be known. Some canned fish and fish products — for example, crab, lobster, some packs of tuna, and caviar — are expensive; but some others, like sardines in mustard or cottonseed oil, and certain grades of salmon, are inexpensive.

ACTIVITIES

1. Class form into groups and each find out for your community one or more of the following and report findings to the entire class:
   (*a*) The grades of meat available in the markets.

(*b*) The prices of the different cuts of meat.
(*c*) How sundry edible parts or variety meats compare in price with each other and with other meats.
(*d*) How fish is sold.
(*e*) How the availability of fish in the market varies during a twelve-month period.
(*f*) Whether fresh fish is an expensive or inexpensive food.

2. Distinguish between government-inspected meat and government graded meat. Are both available in your local markets? How do you identify each?
3. Explain why cured meats are more expensive than fresh.
4. Compare prepackaged meat and fish with unpackaged in price, convenience and other qualities.

PROBLEM 13 *How shall canned foods be purchased?*

The canning of food, though a relatively recent process, has become commercially one of the most important food industries. At the present time there are several thousand companies and individual canners operating canneries. More than 400 different foods and food combinations are offered for sale in cans. Included among these are fruits, vegetables, juices, meats, fish, shellfish, soups, ready-made entrées, specialty products, and milk. Canned foods have made it easier to have variety in the diet the year round and have brought within the budget of the majority of families food from distant lands and food that is out of season locally. Thus the homemaker may have on her shelf, convenient for preparation or immediate service, such canned foods as fruits, vegetables, fish, milk, meat, and sundry pickles and relishes.

Grades and brands

In deciding how to buy canned foods, it is necessary to know how to choose among competing products and to know the quantities and qualities that may be bought most advantageously. Although canned foods should be purchased according to grade, this may not be easy to do, for the grade does not always appear on the label, and the brand names, under which most canned foods are sold, seldom indicate the grade. Too frequently the label contains irrelevant information such as the method

of preparation or a flamboyant portrayal of the product, rather than specific data concerning the quality. As with any food, the use should determine the quality to purchase. Obviously, the higher grades cost more than the lower ones. For many purposes the grades of lower price are just as satisfactory as the higher-priced products.

The United States Department of Agriculture offers the canning industry a continuous plant inspection and grading service for fruits and vegetables whereby a statement testifying to the fact of inspection and grading and a U.S. grade name appears on the label of each canned product. In connection with this service, official grade standards have been

Fig. 120

Fruits and vegetables are canned in different styles. In this instance the quality and brand name for all six styles are the same.

developed for many canned fruits and vegetables after the pattern forms of Tables 67 and 68.

Tomatoes, sweet potatoes, and pumpkins may be canned without the addition of water or salt, but most other vegetables have water, salt, and sometimes a small amount of sugar added.

Only the lowest grade, U.S. Grade D or Substandard, is required to be stated on the label. However, some packers and distributors are taking advantage of the United States Continuous Inspection and Grading Service, and are indicating on all their products the U.S. Grades A, B, C, and D.

Grades have not been established for canned meats and products containing meat or made with a meat base, though government inspection of these foods when packed insures the fitness for consumption.

For most canned fish, there are no grades of quality. Tuna is graded by the industry and the grades refer to the type of tuna and color of meat. Thus Grade I indicates white meat; Grade II, pinkish-white; Grade III, slightly darker; Grade IV, dark or brownish pink. However, the designation "white meat" is used on labels to describe any shade except the darkest, where color is not mentioned. "Fancy" on the label refers to large cut pieces of flesh; "Standard" means that at least 75 per cent of the meat is in large pieces. Small pieces are indicated by such terms as "flaked," "grated," "pieces," and "shredded." The darker and small-piece varieties are the lower priced. The government requires that products labeled "tuna fish" must come from the Albacore or long-finned tuna, the blue fin or leaping tuna, the yellow-fin tuna, or the striped tuna.

Salmon is graded by the industry according to color, texture, and flavor. Five species of salmon are canned, and their names serve practically as grade names. The grades are: first, Chinook, also called King and Columbia River; second, Red, also called Sockeye, Alaska Red, and Blueback; third, Coho, also called Medium Red or Silver; fourth, Pink, or Alaska Pink; and fifth, Chum, or Keta. Each is distinguished by the color and texture of the flesh and the color of the oil. The color and the species are both commonly indicated on the label of the can. Chinook is the most expensive, and Chum is the cheapest.

All grades of tuna fish and salmon are good wholesome products. There is little difference in the grades and varieties as far as nutritive value is concerned.

Sardines are graded for size and the number of fish in the can. With oysters and shrimp, size only is considered. Brand names, size, method

Table 67. GRADES FOR CANNED FRUITS

Grade	Quality of Fruit Used	Syrup
U.S. Grade A or Fancy	Excellent quality, high color, ripe, firm, free from blemishes, uniform in size and very symmetrical.	Heavy, about 55 per cent. May vary from 40 to 70 per cent, depending upon acidity of fruit.
U.S Grade B or Choice or Extra-Standard	Fine quality, high color, ripe, firm, free from serious blemishes, uniform in size, symmetrical.	About 40 per cent. Usually contains 10 to 15 per cent less sugar than syrup used in Fancy grade.
U.S. Grade C or Standard	Good quality, reasonably good color, reasonably free from blemishes, reasonably uniform in size, color, and degree of ripeness, reasonably symmetrical.	About 25 per cent. Contains 10 to 15 per cent less sugar than those used for Choice grades.
U.S. Grade D or Substandard	Lower than the minimum grade for standard.	Often water packed. If packed in syrup, it is not over 10 per cent.

Table 68. GRADES FOR CANNED VEGETABLES

Grade	Quality of Vegetable Used
U.S. Grade A or Fancy	Best flavored, most tender and succulent used, uniform in size, shape, color, tenderness; represents choice of crop.
U.S. Grade B or Extra Standard (sometimes called Choice)	Flavor fine; tender and succulent; may be slightly more mature; more firm in texture and sometimes less uniform than Fancy grade.
U.S. Grade C or Standard	Flavor less delicate; more firm in texture, often less uniform in size, shape, color; more mature.
U.S. Grade D or Substandard	Lower than the minimum grade for standard.

of preparing the fish for canning, and kind of pack are some of the various factors used in classifying most other canned fish. Though the United States Food and Drug Administration has made sea-food inspection service available to individual fish packers since 1934, only the shrimp industry has taken advantage of it. Products so inspected carry on their labels, and legend, "Production Supervised by the U.S. Food and Drug Administration."

Brands in canned foods are more familiar to the average consumer than are grades, and much of the purchasing is done by brand. Many manufacturers produce all of the different grades of a canned food, and give a brand name to each grade. Certain trade or brand names indicate to a large number of consumers the quality of the particular product. But be-

Courtesy of Consumer Reports

Fig. 121

Quality cannot be told by brand name or price. One of these cans tested Grade B and sold for 23 cents; the other was Grade A and its price was 16 cents.

Fig. 122

Grades indicated in this way make the buying of canned foods easier for the consumer.

cause the grade of a brand is not always indicated, and also because there are many, many brand names to learn, the consumer may be uninformed and confused regarding the grade of the product being used. Not infrequently a purchaser buys a brand representing a Choice grade, thinking that it is a Fancy one. If graded canned foods are not available, repeated purchasing of brands found satisfactory is a good practice. Of course, this depends upon whether these brands are regularly stocked by the grocer.

The price of a product labeled with a given brand is not always a reliable guide to the best value. Even though equivalent brands of a certain product may be identical in quality and grade, they may not necessarily have the same selling price. Studies in laboratories and experiences of homemakers have frequently shown that on the basis of cost and quality neither the highest nor lowest priced brands of canned foods give the best value. More information on the label concerning the contents of the can would be helpful. Informative labeling of canned foods should be demanded by consumers.

Statements on labels

The Food, Drug, and Cosmetic Act provides for certain mandatory statements on the labels of canned foods sold in interstate commerce and for certain voluntary ones. The mandatory statements are: the name of the product, the name and address of canner or distributor, and the net contents in avoirdupois weight or liquid measure. Under certain conditions the following also are required:

1. The common usual names of the ingredients must be listed in order of predominance if the food is one for which no standard of identity has been established and is made up of two or more ingredients.
2. Some such statement as "Below Standard Quality — Good Food Not High Grade," or "Below Standard in Quality — Mixed Sizes," must be in a prominently displayed place if the food is one for which a minimum standard of quality has been established and if it fails to meet this standard.
3. A statement of "Below Standard in Fill" must be made if the food is one for which a standard fill has been established and if it fails to meet this standard.
4. In the case of fruit canned in syrup, one of the terms "Extra heavy syrup," "Heavy syrup," "Light syrup," or "Slightly sweetened" must be used. Standards for these syrups have been established.
5. If fruits are canned in water, the fact must be stated.
6. The "style" or form of the pack must be described in standard terms on the label, as whole, halves, diced, and quarters for fruit, and sliced, diced, cut, and whole for vegetables.
7. The variety, as freestone, cling, early, sweet, sour, green, or wax, must be stated in the case of such foods as peaches, peas, cherries, and beans.
8. Artificial flavorings and colorings must be indicated, and imitation products labeled "Imitation."
9. Any chemical preservative used must be listed.
10. Full facts concerning vitamins, minerals, and other dietary properties must be given on special dietary products.
11. If a statement is made in a foreign language, then all legal and mandatory information must be given in that language.

Voluntary statements may be made of such items as size of the product; style and variety of the pack; maturity, consistency, and texture of the product; the brand name; number of servings possible; and other helpful information. All statements added must be truthful, honest, and not misleading.

Containers

Foods are canned in glass and metal containers, the metal ones being known as cans. Glass containers permit the contents to be seen, but they are heavy in weight and easily broken. Hence they are less widely used than the metal ones. Cans are made of iron and steel and coated with a protective layer of tin, enamel or similar substance to prevent rust. Some cans are treated on the inside by baking an enamel or lacquer on steel to form an inert coating of golden yellow. This finish helps the food to keep its color. Two types of these cans are used in the canning industry. One

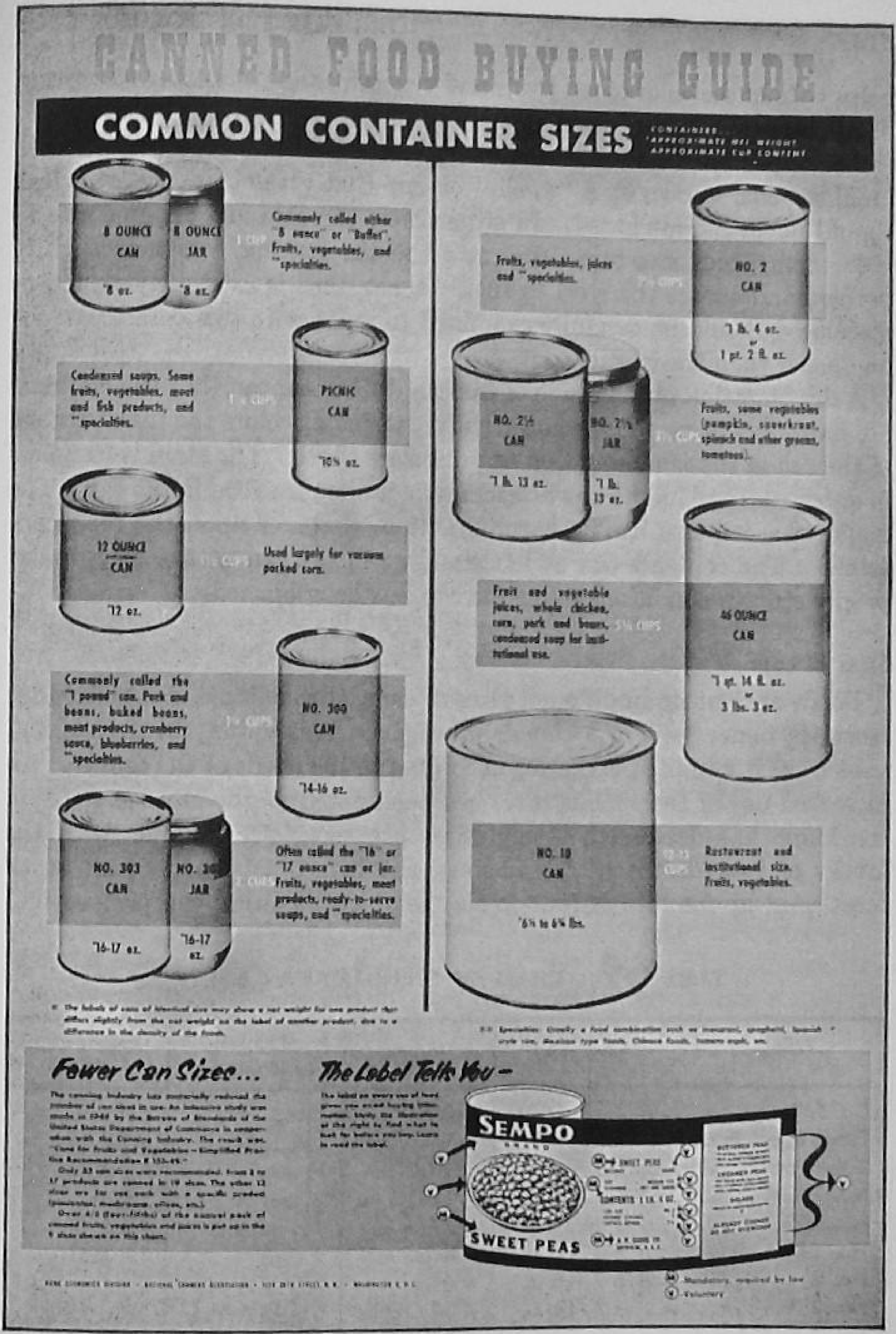


Fig. 123

These can sizes are the ones in common use. Knowing the contents of each in terms of cups or weight is a great aid in wise purchasing of canned foods.

helps to hold the color of red fruits and vegetables and the other to prevent discoloration of food containing sulfur.

The appearance and condition of the can should be noted. A can with bulging ends, known as a "swell," or one that gives evidence of a leak should never be purchased. In either case, the contents are not safe to use. Sometimes moisture penetrates the tin coating, which is slightly porous, and causes the steel to rust. A can that is extremely rusted or discolored should be carefully examined to make sure this defect extends no deeper than the surface.

A discoloration of the inside of the can does not mean that the contents are harmful. Some foods contain sulfur, which discolors the inner surface of the can in the same way that egg discolors silver. The stain is harmless in either case and has no unwholesome effect upon the food in the can. The metal of a can also has no harmful action whatever upon the food contained. The contents can be left standing in the can with safety, under proper storage conditions, after the can has been opened.

Sizes of cans

Foods are put up in different sizes of cans, the contents of which range from 4½ ounces to 6 or 8 pounds in weight. This variety in sizes is convenient as it permits purchasing according to the needs of the family. An increased use of the smaller sizes has been noted as the storage space in the home has decreased. Small sizes are especially popular with the family of two members. Three sizes, numbers 2, 2½, and 3, are those most used by families of four to six members. During the past several

TABLE 69. CHART OF STANDARD CAN SIZES *

Can	Diameter	Height	Contents in Cups	Average net Weight
8 Z Tall	2 11/16 in.	3¼ in.	1 cup	8½ oz.
Picnic No. 1 East	2 11/16 in.	4 in.	1¼ cups	10½ oz.
Baby Foods	2⅛ in.	2⅞ in.	½ cup	5 oz.
No. 1 Tall	3 1/16 in.	4 11/16 in.	2 cups	16 oz.
No. 300	3 in.	4 7/16 in.	1¾ cups	14½ oz.
No. 303	3 3/16 in.	4⅜ in.	2 cups	16 oz.
No. 2	3 7/16 in.	4½ in.	2¼–2½ cups	1 lb. 4 oz.
No. 2½	4 1/16 in.	4 11/16 in.	3¼–3½ cups	1 lb. 13 oz.
No. 3 Cylinder	4¼ in.	6⅞ in.	5¾–6½ cups	2 lbs. 14 oz.
No. 10	6 3/16 in.	6 15/16 in.	12–13 cups	6 lbs. 10 oz.

* Adapted from publications of Home Economics Division, National Canners Association.

years the number of can sizes has been greatly simplified. Instead of the 258 different sizes that were once in use, there are now but 10 to 12 sizes commonly on the market. Knowledge of the capacity of the commonly used sizes of cans greatly facilitates intelligent purchasing.

The exact weight of the contents of cans of a given size varies, due to the difference in the density of various foods. For example, cherries are heavier than green beans. Thus, the contents of a No. 2 can of cherries weigh 1 lb., 5 oz., while those of a No. 2 can of green beans weigh only 1 lb., 3 oz.

The sizes and shapes of the cans used for fish differ from those used for vegetables and fruits. A 16-ounce can for fish is a large size and a 3¼-ounce can, though small, is not uncommon on the market. Therefore, the contents in weight should be noted in estimating the amount needed.

Other considerations

The use that will be made of the food should always be considered in purchasing canned products. If soups, soufflés, casserole dishes, and the like are to be prepared, an expensive grade is not necessary If the fruit or vegetable is to be served separately, and the shape, flavor, and color of the product are important, the best grade will most likely be desired. For a salad, broken slices or pieces are as satisfactory as whole ones; for salmon loaf, fish medium red or pink in color will be suitable. In keeping the food expenditures within a certain amount, the homemaker frequently purchases the less expensive grades even though the product served will not be so attractive. The food value may be just as high in the lower grade, and the actual food needs of the family as adequately met.

Sometimes the purchase of a brand is influenced by the advertising that has been done for it. Billboard, radio, television, and magazine publicity are all based upon this concept. The purchaser should make sure that he is receiving the actual quality desired rather than merely a brand name, however much it may have been advertised.

Special sales are frequently offered on canned foods, and because of the reduced price the homemaker is led to increase her purchases. One should carefully note the grade and brand offered in such a sale and also compare the reduced price with the regular price of the product. Homemakers report that although buying in quantity may bring a reduction in price, it does not always result in true economy. Having a large quantity of food on hand may sometimes foster a tendency to use it lavishly or in excess of need. Further, the purchase of a large quantity of canned foods in excess of the probable need of the family may prove an inconvenience by tying up an undue share of the money allowance for food.

ACTIVITIES

1. Examine different brands of a given canned food. Note the brand names. Is a grade designation shown? How?
2. Compare the labels of a number of canned foods. Classify these as to grade, descriptive and informative. Which type or types prevail?
3. Class form into groups and each group:
   (*a*) Grade 3 or more canned food products. Name the uses of each grade.
   (*b*) Compare similar grades of canned foods of several packers or jobbers. How do price and quality compare?
4. Plan an "emergency shelf" of canned foods for a family of five — parents and three children, ages 9, 12 and 15. Estimate the cost.

REFERENCES

American Home Economics Association, 1600 Twentieth Street, N.W., Washington, D.C., *Handbook of Food Preparation*, 1954.

Coles, Jessie, *Standards and Labels for Consumer's Goods*. New York: The Ronald Press, 1949.

Consumers Union of U.S., Inc., 17 Union Square, New York City, *Consumer Reports*. Monthly Publication.

Household Finance Corporation, Money Management Bulletins. Chicago, 1954.

National Association of Retail Grocers, 360 N. Michigan Ave. Chicago, Ill. *Produce Guide*, 1954.

Sweetman, Marion DeYoe and Ingeborg MacKellor. *Food Selection and Preparation*. New York: John Wiley and Sons, Inc., 1954.

United States Department of Agriculture, Washington, D.C., *Helping Families Plan Food Budgets*, Miscellaneous Publication, No. 662.

United States Department of Agriculture, Marketing and Buying Guide bulletins, 1954.

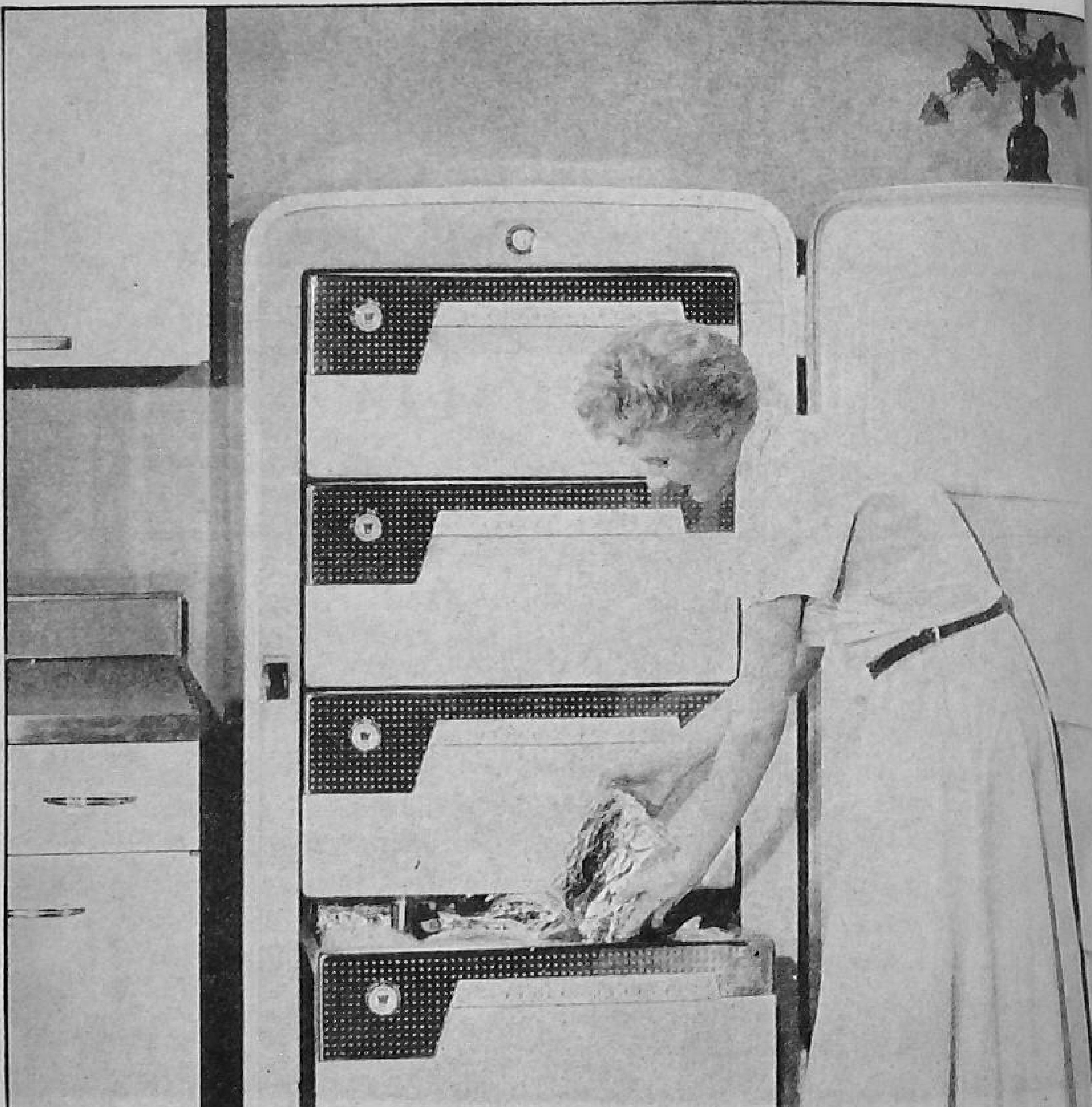
United States Department of Health, Education and Welfare, Washington, D.C., *Food, Drug and Cosmetic Act No. 1, Revision 4*, 1953.

———. Milk Ordinance and Code, 1953.

Unit Four

UNIT FOUR

Preserving Food



Courtesy of Westingh

for Future Use

THERE IS NO record of the time when foods were first preserved for later use. One of the early forms of preservation was undoubtedly drying. It is probable that this means of extending the food supply was discovered accidentally. In the beginning, perhaps clusters of grapes left on the vines dried, and developed a sweet, fruity flavor. Centuries before the Christian era, appreciation of such dried fruits had so developed that dates and grapes were dried in the sun and stored away for winter use. At an early time figs and currants too were preserved in this manner.

Common storage undoubtedly goes back to the time when man first began to gather food in an attempt to provide for the winter season. He probably early discovered that a few feet below the earth's surface there prevails throughout all the seasons a quite uniform temperature of from 10° to 16° C. (50° to 60° F.). Probably natural caves in the rocks served as man's first storerooms. Later, as his abode became settled near his field or pastureland, he provided artificial caves for food storage. Such were the cellars of the early settlers of this country. Still today farm-dwellers in many sections of the country, and even people in the smaller towns, find the "root-cellar" a way of providing for food storage in the home. Here the food is protected from freezing in winter and is provided some degree of coolness in summer. Pioneer women made butter in May and June and "put it down" in these cellars for winter use. Inefficient as this method of storage is, it was the best available to a more primitive economy.

The oldest Biblical accounts tell of the preservation of fruit juices by fermentation. This method differs from drying and common storage in that it involves a change in the chemical nature of the food, affecting markedly its flavor. Another method of food preservation common in ancient times was that of preserving fruits by the addition of sugar, spices,

and other condiments. In early days sugar was as rare as spices, and as costly. Great trade routes grew up as a result of effort to obtain these food adjuncts for use in localities where they were not produced. To these methods, more recently, have been added preservation by canning, cold storage, and freezing.

The discovery of canning as a method of food preservation was stimulated by Napoleon. He desired adequate rations for his armies, including the fruits and vegetables with which they were familiar. During the latter part of the eighteenth century, the French Government at Napoleon's request offered a prize for the discovery of a practical method of preserving foods; and in 1809 this prize was awarded to M. Nicholas Appert for the method that he submitted. By this method fruit was heated, then enclosed in a glass bottle which was corked and again heated, this time in boiling water. Although M. Appert did not identify the principle, the food was successfully preserved by this method. From that year on, canning as a means of preserving food was recognized in England, and in 1819 it was established as an industry in the United States. Strange to say, the first foods canned in this country were salmon, lobster, and oysters, foods now known to be difficult to can.

Although cold storage and freezing generally are considered modern discoveries, attempts at this type of preservation were made quite early. It is said that in 1626 Lord Bacon, now considered a pioneer investigator in the cold storage of food, alighted from his carriage on a cold day to stuff a chicken with snow in order to see whether or not it would keep at that temperature. Unfortunately he contracted a cold which caused his death. Thus ended for a time experimental work on this subject. It was not until the beginning of the nineteenth century that refrigeration was undertaken on a large scale. In 1805 large ice houses were built for the storage of natural ice, and by the middle of the last century this practice had become common. Ice was made by purely mechanical means during the eighteenth century, but not until late in the next century, when a shortage of natural ice made it urgent, did the manufacture of ice become common. Now ice is usually available wherever Western civilization exists and is regarded not as a luxury but as a necessity. Mechanical means of refrigeration have been developed until many industries and homes depend directly upon this process, rather than upon ice, for the preservation of food.

Rather closely associated with the development of mechanical refrigeration is the freezing of foods as a method of preserving. The extremely low temperatures obtained make possible rapid freezing of foods.

Although freezing as a method of preserving foods for home use is a comparatively new method, it was given great impetus during World War II. Victory gardens, the rationing of meat, and the resulting desire of everyone to have as much food in reserve as possible, created a demand for frozen-food storage space far in excess of that available. Today urban families as well as rural ones are not only familiar with the possibilities of frozen foods but are also aware of some of their limitations. Prepared and precooked foods, as well as meats, vegetables, and fruits, are now being frozen on a fairly large scale. Frozen prepared meals are no longer merely a dream for the future, but they probably will not become an everyday commodity for most families for some years to come. Although freezing as a method of preserving foods is still in somewhat of an experimental stage, practically all fresh fruits, all meats, and all vegetables to be served cooked are now preserved by this method.

To realize in some measure the value of food preservation, imagine all knowledge of canning destroyed, all means of cold storage removed, all artificial drying eliminated, and all chemical preservatives undiscovered. How would daily living be affected?

Food preservation is essential from a dietary standpoint. The present knowledge of food indicates the desirability of including a variety of foods in the well-balanced diet. Due to the low cost of preserving foods of all kinds, even the family of moderate means has available a variety of foods unheard of a few centuries ago. Oranges, tomatoes, and grapefruit — all valuable sources of ascorbic acid — may be had during every month of the year. Lettuce is no longer available only in the spring and summer months from local gardens, but is a year-round vegetable transported under refrigeration for long distances, often at great speed, by truck, train, or plane. In fact, there are few foods which cannot be obtained at all seasons of the year. Milk, at ordinary temperatures, quickly sours. If cold, it may be kept for a time sufficient to allow transportation to the cities where it makes possible the maintenance of the health of many infants; and if partially evaporated and frozen, it may be shipped to countries far distant from the source of supply.

Food preservation is essential from a hygienic standpoint. Good wholesome food is a prerequisite to health. Only as perishable and semi-perishable foods are successfully preserved may they be kept from forming products harmful to the body. Decomposed vegetables, fermented fruits, and spoiled meats are always undesirable and frequently harmful.

Food preservation is essential from an economic standpoint in a civilization as complex as our own. It has made possible the development of

the fruit industries of the western coast, of large-scale meat production in South America, and of extensive dairy farming in rural districts. For example, cold storage makes possible the shipping of fresh fruits and vegetables for long distances with little loss. Formerly, from 14 to 26 per cent of the oranges and lemons shipped for long distances were lost by decay. Modern methods of treating the fruit, chilling thoroughly, and shipping under refrigeration have reduced the loss to 2 per cent or less.

The development of various methods of food preservation has made the production of a wide variety of foods profitable, for they need not all be marketed when in season, but some may be held until there is a greater demand for them. For the consumer, it has made possible quantity buying when the food is best and cheapest. Foods from far-away lands are placed at the disposal of the purchaser in good condition with little decay and decomposition. Facilities for food preservation in the home have made it possible to save food that would otherwise be lost, thus making it available in a satisfactory form for a later time.

Spoilage of Foods

Since the dawn of history, man has had a great struggle to preserve enough food so that he might exist from one growing season to the next. Because his food, in one form or other, also nourishes hoards of smaller organisms ranging from rodents and insects to countless bacteria, yeasts, and molds, its preservation has been difficult. No doubt he early learned that, even when protection from rodents and insects was equal, certain foods had better keeping qualities than others. His dietary habits developed in relation to this fact.

Classification of foods as related to spoilage

The same observation concerning foods holds today: some spoil readily, others keep for longer but limited periods, and some may be stored almost indefinitely at ordinary temperatures with no spoilage occurring. The *perishable* foods, those that spoil easily without some means of preservation, begin to deteriorate almost immediately. Milk, meats, sea foods, fresh asparagus, green corn, and juicy foods, such as peaches and tomatoes, are of this class. The *semi-perishable* foods, those that keep for a limited time, have fair keeping qualities. Foods of this class do not spoil readily

and may be kept for several months by the common method of storage. They include mature potatoes, beets, turnips, carrots, and certain kinds of apples and pears. *Non-perishable* foods, that can be stored almost indefinitely, include the cereals, and dried beans, peas, and other legumes.

Why do these foods vary in keeping quality? The percentage of water contained is probably the greatest factor. Perishable foods are extremely high in water content. The vegetables of this class generally are immature, and the fruits juicy and somewhat soft. Meats, eggs, and milk, protein foods that are high in water content, also deteriorate rapidly. The semi-perishable foods are, for the most part, mature vegetables and fruits. Foods of this class are less juicy. Although they have a rather high water content, it seems to be held firmly within the flesh of the food. Most of these foods have a firm covering or skin which also offers protection. Non-perishable foods have an exceedingly low water content which, if increased, results in the spoilage of the food.

Agents causing spoilage

Food spoilage is due to the action of specific agents that cause physical and chemical changes. On a warm damp day it is not uncommon to open the bread box and observe upon a loaf of bread a fuzzy gray growth that is readily recognized as mold. Fruits, either fresh or canned, meats, and in fact practically all natural foods are susceptible to attacks by mold. An equally familiar sight is the fruit juice or fruit sauce that contains many bubbles of gas. The gas is carbon dioxide and is produced by the action of yeast upon the sugars of the fruit. Frequently the pressure of the gas is sufficient to break the seal of the container. A third type of spoilage, that resulting from the action of bacteria, is shown in the putrefaction of meats and eggs and in the souring of milk. In the case of fruit, enzymes within the fruit which are desirable in causing it to ripen will, if allowed to continue their action, cause it to become overripe and later to spoil. A ripe peach, plum, or similar fruit, seemingly perfect, soon softens and becomes stale. Enzymes are largely responsible for this change.

In every case these agents develop at the expense of the food with which they are associated, often causing changes in the appearance as well as in the flavor and odor of the food. The first three listed above — the molds, yeasts, and bacteria — are microorganisms and are widely distributed in the air, in water, and on all exposed surfaces. Enzymes, the fourth spoilage agent, are present in all living matter.

The microorganisms, although causing widely different changes in food, have much in common. They may exist in two forms, in the vegetative

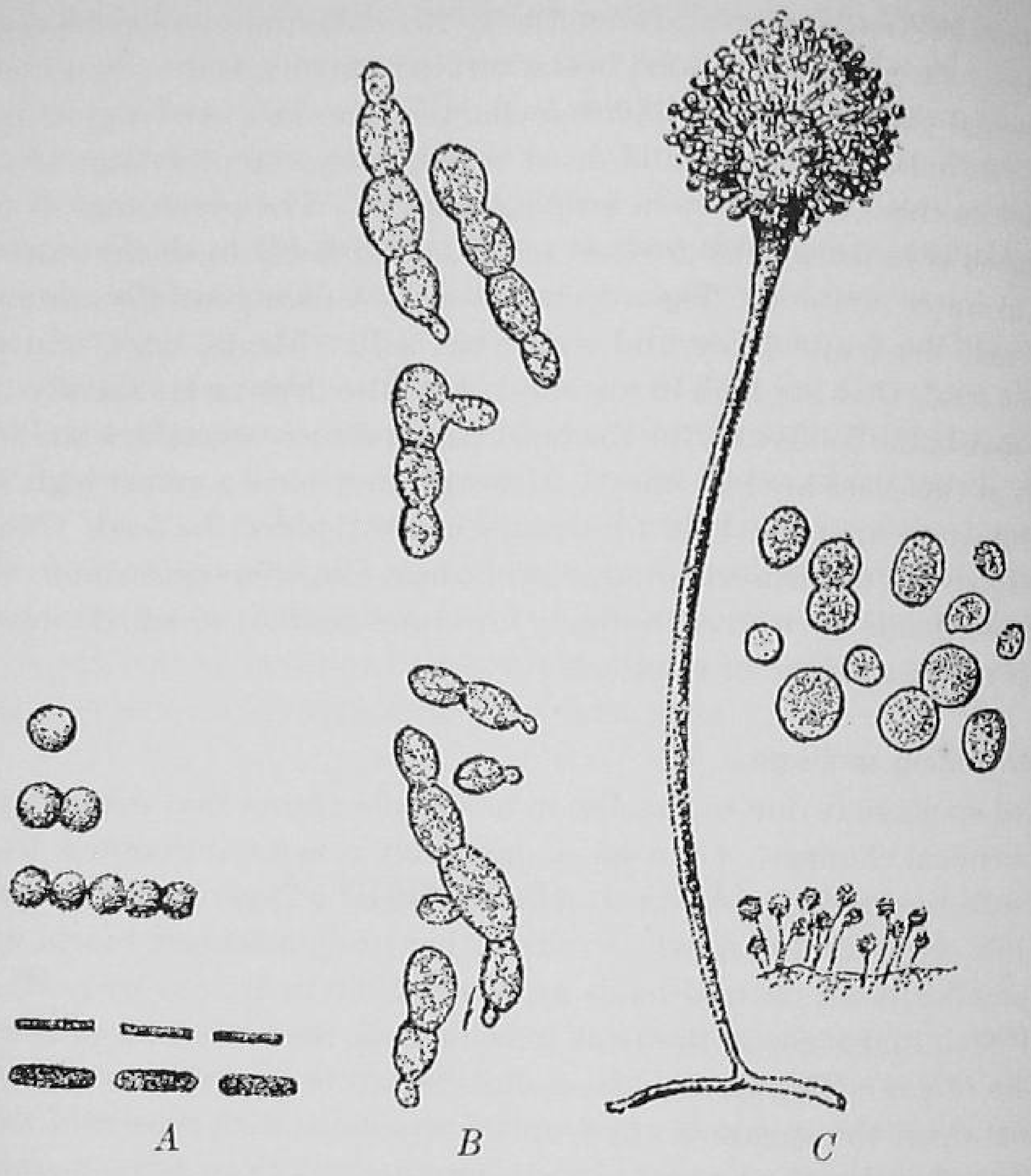


Fig. 124

Common spoilage agents widely distributed and responsible for much of the spoilage of both fresh and processed foods are: *A.* Bacteria. *B.* Yeasts. *C.* Molds.

or growing state and as spores or the resting state. Spores resemble in some ways the seeds of macroscopic plants. They are much more resistant to adverse conditions than are the vegetative forms, and so furnish a means whereby the microorganisms may survive periods of adversity. Each of these organisms develops rapidly at a limited temperature range. All are destroyed by high temperatures, and growth is retarded by low temperatures. All need moisture and food for development, and most of them require free oxygen such as they may obtain from the air.

Molds are the only agents causing spoilage which are visible to the naked eye. The spores are present in the air, and quickly settle on the surface

of any exposed substance. If conditions are favorable, the spores germinate, and soon the fluffy growth of mycelium may be seen. The growth is gray, at first, but as the spores develop it acquires a color, commonly bluish-green, but sometimes black, red, or orange, depending on the kind of mold. These grow best on carbohydrates but develop on a much wider variety of foods than do yeasts or bacteria. They grow on acid foods such as lemons, on neutral foods such as bread and meat, on sweets such as jams and preserves, on "cured" foods such as bacon and ham, and even on organic substances other than foods, such as leather, wood, and cotton. In fact, any substance containing carbon, hydrogen, and oxygen may be subject to attack by these agents. Molds develop most rapidly in warm, damp, dark places filled with stagnant air. Hence, the common bread box in damp weather is highly suitable to their development.

Molds require much less moisture than is necessary for yeasts and bacteria. The temperature best suited to their growth is between 20° and 35° C. (68° and 95° F.). However, a temperature lower than that of the home refrigerator is necessary to stop their development completely, as is evidenced by the way some foods become moldy in the refrigerator. Molds are readily destroyed by boiling the affected foods for a short time, or by heating to a temperature of 71° to 82° C. (160° to 180° F.) for one hour. As a rule, molds are undesirable. However, the distinctive flavor of certain cheeses is due to the development of molds during the ripening processes.

Yeasts are microscopic in size. Wild yeasts are always present in the atmosphere, and all foods exposed to the air are soon contaminated. Yeasts grow best in foods containing sugar. Acid in moderate amounts does not retard their development. Large quantities of oxygen are necessary for optimum development. Water is also necessary, and it is believed that certain inorganic elements such as phosphorus, nitrogen, calcium, and sulfur, if not actually necessary to their development, at least accelerate it. Yeasts cause a fermentation of the sugar, which results in the formation of carbon dioxide and alcohol. As the alcoholic content of the food increases, fermentation is retarded and finally entirely checked. Fermentation is most rapid between 20° and 38° C. (68° to 100° F.). Yeasts are readily destroyed by boiling or by heating to a temperature of 71° to 82° C. (160° to 180° F.) for twenty minutes to an hour depending on conditions. Fruits, especially fruit juices, are subject to fermentation. Cider ordinarily becomes "hard" within a few days, and grape juice is quickly fermented. However, these beverages may be kept for long periods if the yeast already in them is destroyed by heating and further entrance prevented by sealing the juices in a container. Yeast, though of value as the

leavening agent in the making of bread, is destructive to many other foods.

Bacteria, too, are microscopic organisms, ever present in the atmosphere and in all non-sterile substances. There is a greater variation in the different types of bacteria than in the yeasts and molds. Bacteria, as a class, grow on a wide variety of foods, though each type usually flourishes best on one certain kind. Protein foods are necessary for many types, and carbohydrates for others. Those foods with a distinct acid or alkaline reaction are unfavorable to their development. Thus, generally speaking, bacteria develop rapidly only on foods with a neutral or almost neutral reaction. Under favorable conditions, bacteria develop more rapidly than yeasts and molds, and the resultant products of decomposition tend to suppress further growth of these other organisms.

Bacteria require much moisture, food with at least a 25 to 30 per cent water content being necessary for their growth. They also require warmth, the degree at which they develop most rapidly varying between 20° and 55° C. (68° to 131° F.). Those requiring a comparatively high temperature are known as *thermophilic* bacteria and are responsible for spoilage in canned foods which are packed hot and not processed immediately or not quickly cooled after processing. Bacteria differ in their requirements for oxygen. One class, the *aerobic*, require free oxygen as is found in the air; another class, the strictly *anaerobic*, cannot live in the presence of any quantity of free oxygen; and the third class, the *facultative*, live either with or without free oxygen. It is some of the second class, the anaerobic, which produce the toxic substances that cause the producer of canned foods the greatest concern. It is to this class that *Clostridium botulinum*, commonly known as *Bacillus botulinus*, belongs. Botulism, resulting from the consumption of foods containing the toxins produced by the *Clostridium botulinum* is one of the most dreaded forms of food poisoning.

The spores of bacteria are much more resistant to heat than are the spores of molds and yeasts. Spores of bacteria have been known to resist boiling for as long as sixteen hours. A temperature greater than that of boiling water, such as is produced under pressure, is necessary to destroy spores of bacteria in a reasonable length of time. Bacteria in vegetative state are readily destroyed by boiling and by direct exposure to sunlight, but the spores, on the contrary, are not greatly affected by sunshine. Low temperature, 10° C. (50° F.) or less, slows up bacterial growth, but a temperature approaching freezing is necessary to check their growth appreciably. Many home preservatives are of value in retarding or preventing the development of bacteria. Sugar and salt are the most common of

these preservatives. As with molds and yeasts, some bacteria are of value in food preparation. Sauerkraut depends upon the action of bacteria for both flavor and keeping qualities. Butter, butter substitutes, and many cheeses owe their characteristic flavor to the action of bacteria. Vinegar is also the product of bacterial action.

The fourth agent causing spoilage, the enzymes, unlike the others, is not an organism, but a chemical substance. Enzymes cause changes to occur within the foods without themselves being changed. They occur in all organic matter and are elaborated by the living organism. They are soluble in water and act best at about body temperature. They cause fruit to ripen, and if allowed to continue to act, cause it to become stale. They are rendered inactive by boiling. Enzymes are not a serious cause of spoilage in canned foods for as a rule they are destroyed by the heat to which the foods are subjected during processing. They are, however, a serious problem in retaining quality in frozen foods. Of the foods commonly frozen, vegetables show the greatest deterioration during storage if the enzymes are not destroyed. However, fruits may darken and meats become rancid, even at a storage temperature of 0° F., if they are not adequately protected.

Effects of agents causing spoilage

Different types of spoilage result in different types of end products. The growth of one organism may affect the food in such a way as to cause changes that are physiologically harmless, but another organism, perhaps belonging to the same class, may produce a deadly poison.

Molds do not usually produce harmful substances. When only a slight growth of mold is on the food, a few flecks here and there, it may be removed and the food eaten with comparative safety. If the growth of mold is heavy, the whole mass of food may be changed in flavor and sometimes in texture. In such cases, with the exception of certain cheeses, the food should be discarded. As any great quantity of mold is visible and also has a definite flavor there is little danger of eating moldy food unknowingly. Among the canned foods, it most frequently attacks fruits; it is seldom found in canned vegetables and meats. Bread, oranges, and lemons, among the foods kept in common or cold storage, often mold; meat also molds when held at certain conditions of temperature and humidity.

Yeasts cause food to ferment. Although in the preparation of wines and fermented beverages this may be a desirable process, as related to food preservation, it is not. This type of spoilage is usually indicated by bub-

bles of carbon dioxide. Fermentation injures the food value by the formation of carbon dioxide and alcohol from the sugars. This affects the odor and flavor of foods. Spoilage by this agent may be detected by appearance, odor, and flavor. It is harmful to the body in proportion to the alcohol produced. Fruits ferment readily; especially is this true of cooked fruits which contain only a small or medium amount of sugar. Pickles also ferment under certain conditions of storage.

Bacteria cause a variety of changes that may or may not be apparent. As changes brought about by bacteria are often dangerous, care should be taken to avoid the use of foods spoiled by these agents. Several types of spoilage are the result of bacterial action. The formation of gases is rather common. These may be carbon dioxide or hydrogen, which is responsible for the "swell" in tin cans containing spoiled food, or hydrogen sulfide or ammonia, which is dissolved in the liquid. The flavor and odor of the food are especially affected by the soluble gases. Another type of bacterial spoilage is known as "flat sour." This type of spoilage, occurring at relatively high temperature (43° to 66° C. or 110° to 150° F.), is most frequently found in canned foods that have been held at a relatively high temperature for some time after packing and processing. It is frequently found in canned corn. Flat sour gives to a food an acid flavor. Occasionally there occurs some disintegration of the food, which is evidenced by the turbidity of the liquid surrounding it. However, turbidity may be the result of overcooking rather than of spoilage, so evidence other than turbidity is generally required before the food is discarded. Odors and flavors may vary widely, but any abnormal odor should be sufficient to mark the food as unfit for consumption.

The last and most dangerous form of spoilage is due to the formation of toxins. These are deadly poisons and are most treacherous, for often no obvious change in appearance, odor, or flavor of the food accompanies their formation. These toxins are frequently the product of spore-bearing bacteria, those which are the most difficult to destroy because they do not require free oxygen for their development. Hence, canned foods are especially suitable for their formation. Little danger is involved in the use of commercially canned foods or of home-canned fruits, but home-canned meats and vegetables may be harmful. These protein-rich and non-acid foods are good media for the spore-bearing toxin-producing bacteria. Too much emphasis cannot be placed upon the necessity of discarding all foods which show any indications of spoilage and of heating thoroughly all home-canned non-acid foods before tasting. Heating corn, spinach, and meat to boiling for twenty minutes and all other vegetables

for ten minutes destroys the toxic effect of the substance produced by these organisms, and the organisms themselves are, as a rule, not harmful.

Enzymes cause fresh fruits to become stale and in the presence of oxygen are responsible for the discoloration of certain foods. Peaches, apples, potatoes, and similar foods are quickly discolored when peeled and left in the air. Likewise many frozen fruits and certain canned fruits discolor when exposed to air. Frozen fruits as well as frozen vegetables and meats may develop an off flavor when exposed to oxygen. This has led to extensive use of protective agents called antioxidants which may greatly retard the onset of off-flavor and other undesirable characteristics. Spoilage of foods by enzymes is seldom harmful. This type of spoilage is made evident by the change in color, flavor, and often texture.

Methods of Preservation

As the principal spoilage agents are normally present in food, destroying them or preventing their development becomes the chief problem of food preservation. Any condition opposed to the development of these organisms, whether by retarding their growth or by entirely destroying them, aids in the preservation of food. Methods commonly used to this end include common or cellar storage, refrigeration, canning, freezing, the use of preservatives, drying, and the exclusion of air. Although not a commonly used method at this time, "cold sterilization" or irradiation by beta and gamma rays to prolong the keeping quality of foods is being widely studied experimentally. The possibilities of this method of food preservation are great. When some of the major problems now limiting its use are solved, it is probable there will be radical changes in the present accepted methods of handling foods.

Storage

Common storage is used rather extensively in many homes as a means of preserving food. Large families find this method of storing food most profitable, as many vegetables and some fruits may be stored in quantity and kept throughout the winter months and well into the spring. Semi-perishable foods are best suited to common storage. Products to be stored should be of high quality and the proper degree of maturity. Potatoes, late maturing apples and pears, mature beets, turnips, carrots, and onions

are often kept in this manner. Successful common storage requires a cool, dark room of the proper humidity (pages 153–154). A dry atmosphere results in evaporation of moisture from food, leaving it shriveled and dried; on the other hand, a moist atmosphere is ideal for the growth of microorganisms and also hastens plant growth. A low temperature is also desirable as it delays the action of the agents causing spoilage and tends to prevent plant growth among the tubers, bulbs, and roots. The exclusion of light likewise inhibits plant development. The space for the common storage of foods, though once an artificial cave, is now more often a room in the basement which is surrounded by a well-insulated wall. If the space is well planned, a small room will accommodate a large quantity of food.

Common storage in a country home involves little or no expense, for often the cellar is partitioned or the cave is built in a season when there is little routine work on the farm and no outside labor need be hired. Few materials are needed, and the upkeep is small. Careful watching and planning in the use of the food may prevent any great loss. However, common storage is not as efficient as refrigeration. Even apples and pears, which have good keeping qualities, show much greater loss due to decay in common storage than in cold storage. It is now possible to buy or rent storage space for barrels or boxes of apples or other foods to be held at low temperatures but above the freezing point.

Space in freezer locker plants for the storage of frozen foods is also available and extensively used in many communities.

Microorganisms, although not readily destroyed by severe cold, are much less active at low temperatures. When frozen, as a rule, they remain alive but dormant. When conditions become favorable, they resume growth. At temperatures slightly above the freezing point they develop slowly. As the temperature increases the organisms become more and more active until at temperatures of 7° to 10° C. (45° to 50° F.) they may cause the spoilage of perishable foods in a relatively short time.

Refrigeration is widely used both in homes and in commercial plants as a means of maintaining the low temperatures found satisfactory in the storage of perishable foods. Fresh milk, meat, and similar foods keep best just above the freezing point. Certain fruits and vegetables also keep better when cold, although as a rule they do not require as low a temperature for the limited time they are stored in the home as do the protein foods cited. Under-ripe fruits usually ripen rapidly at room temperatures. Low temperatures extend the keeping period for both under-ripe and ripe fruits by reducing the enzyme action which causes ripening of under-ripe fruits and frequently the spoilage of ripe fruits. The keeping of cooked

foods and leftovers is greatly facilitated by refrigeration, which is a more expensive but also a more efficient method of preservation than common storage.

Wrapping certain fruits and vegetables in paper or cellophane, or coating them with wax, improves the keeping quality. Pears and apples of high quality to be kept for winter use, and oranges, lemons, and grapefruit are often wrapped. The fruit or the paper in which it is wrapped may be treated to retard mold formation. Cucumbers wrapped individually in moisture-proof cellophane and held for eight or ten days in storage at 4.5° C. (40° F.) remain practically equal in quality to fresh ones. Green peppers, tomatoes, oranges and other citrus fruits, cucumbers, and cantaloupes are among the foods whose keeping quality is improved when they are coated with wax.

Studies indicate that during storage, whether common or cold, fresh vegetables and fruits may undergo changes in flavor, texture, and food value. The extent of these changes depends upon the length of time stored and the conditions under which they are held. Both desirable and undesirable changes have been noted. In the garden pea the sugar may be changed to starch; in asparagus the sugar may be changed into a woody cell-wall substance; and in the potato as well as in certain fruits the starch may be changed to sugar. The pectin content of many fruits that have been in storage is less than that in those that have not been stored. The vitamin content, too, may be significantly decreased. This is especially true of ascorbic acid. Holding in snow-ice or in cracked ice has proved to be highly beneficial in delaying these changes.

Heating

Food is commonly preserved through the application of high temperatures. A temperature considerably above that of the body may result in either a pasteurized or a sterilized product. Foods are commonly pasteurized by being held at a temperature of from 60° to 66° C. (140° to 150° F.) for thirty to forty minutes, during which time most of the organisms, although not all, are killed. Spores and some vegetative forms of bacteria remain, but as a rule those causing disease are destroyed. This method is used for temporary preservation of milk, and for preservation of fruit juices and other fruit products of delicate flavor. Sterilization of a food or a substance destroys all life in it or on it, and involves heating for a longer time or at a higher temperature than is necessary for pasteurization. Acid foods are rendered sterile by boiling for a comparatively short time. Acid in foods hastens the destruction of the organisms.

Non-acid foods must be heated longer than acid foods. Heating from thirty to sixty minutes at a temperature of 121° C. (250° F.), which may be obtained by heating under pressure, is usually sufficient to destroy all bacteria.

Canning

If the effectiveness of pasteurization and sterilization is to extend over a period of time of practical significance, the material thus treated must be protected from fresh contamination by microorganisms. The fact that in canning the sterilized or pasteurized food is afforded such protection accounts, at least in part, for the rapid growth in popularity of the process as a means of food preservation.

Before the discovery of canning, it was impossible to keep perishable foods for any great length of time. Men engaged in sea and military service or in occupations that kept them in frontier posts suffered from lack of variety in their diet. Also in regions where common storage was impossible except for extremely short periods, people suffered from the lack of a number of important foods in their diet. The development of canning as a method of preserving food has been an important factor in changing the dietary practices of people everywhere.

It was originally believed that the preservation of food by canning was due to the absolute exclusion of air. Not until more than fifty years after the first development of canning methods did the discovery of bacteria lead to the recognition of microorganisms as the real cause of food spoilage. The first foods preserved by canning were sealed in glass. Earthenware was later tried unsuccessfully. Soon tin containers were used. In 1825 the first patent on a tin can was taken out in America. Since then, invention has followed invention, until today, highly efficient machinery and improved containers make possible the production of immense quantities of canned foods for both home and commercial use. Many families can enough fruits and vegetables during the spring, summer, and autumn months to last until the new crop is available. Other families use only commercially canned foods.

All prejudice which once existed against canned foods has been removed. Experiments have shown canned foods to be as wholesome as any form of preserved food. Often the canned food is found to be superior in food value to the freshly cooked.

Canned foods are ready for use on a moment's notice. When food is to be kept over a long period of time, canned products are also most satisfactory and they do not require special temperatures or equipment for storage.

Freezing

Freezing, like cold storage, does not destroy the microorganisms and enzymes present in foods. It does render them more or less inactive, however, so that frozen foods, when held at the proper temperature, undergo change slowly. This applies to the nutritive value as well as to other chemical and physical characteristics.

Practically all common fruits are now preserved by freezing. However, the ease and success with which the different fruits can be frozen varies. Strawberries remain one of the most popular fruits for freezing. Possibly this is because their season is somewhat limited, they are highly perishable, and they are so completely changed by cooking or canning. Most of the vegetables that are served cooked may be preserved by freezing. Scalding to destroy the enzymes is essential for successful preservation of almost all vegetables by this method. Hence vegetables to be used fresh and crisp in salads cannot be preserved by freezing. Fish, poultry, and game, as well as beef, veal, pork, and lamb, are preserved by freezing. Work with frozen meat shows that freezing renders certain samples of beef more tender. However, this is not true of all beef. The effect of freezing upon tenderness seems to be dependent upon the quality of the beef being studied, upon whether or not it has been ripened prior to freezing and possibly upon the rate of freezing. Pork fat undergoes oxidation more readily than the fat of other meat, with the result that the fat becomes unpalatable. Low storage temperatures tend to retard this change. Today precooked and prepared foods make up a large portion of the foods frozen. They are convenient and often save time. Frozen foods have little or no waste at the time of using, and little time is required for preparation. However, time must be allowed for the thawing of fruits to be served raw, and the cooking period of frozen meats and vegetables not already defrosted must be sufficient to allow for both thawing and cooking.

Using chemical preservatives

Certain chemicals are helpful in preserving foods either by retarding or preventing the growth of microorganisms. These may be either added to the product or produced in it by fermentation. Sugar, a common home preservative, is often used in such quantities as to increase the concentration of the food and make it an unfavorable medium for the organisms. Salt and acid, in the form of vinegar or lemon juice, are other substances added for their preservative action. Not infrequently, the fermentation process is used to produce, within the food itself, acetic or lactic acid that exerts the same preservative action as is obtained by the addition of vinegar. Salt is used as an aid in the preservation of vegetables by fermenta-

tion. It aids both in drawing out the juices and in delaying the action of certain spoilage agents. Formerly, spices were often used in such quantities as to have a definite preservative effect. Today, the concentration in which they are used is usually less than that employed earlier and it is believed that only a few of them are of value as preservatives.

Certain preservatives such as borax, boric acid, sulfites, and formaldehyde, once sold as canning powders, are now considered injurious to human beings, and their use is usually prohibited.

Preserving and pickling

Preserving and pickling are methods of preservation frequently employed. Long before canning was known as a means of preserving foods, the use of preservatives was practiced. Salting of foods was an early method of preservation. Salt is a valuable preservative, both as an antiseptic and as an agent for removing water. Placing foods in brines of certain concentration promotes fermentation, and the foods develop an agreeable flavor. Sugar in large amounts is likewise a favorite preservative. It is the one used in making preserves, jams, jellies, and marmalades. Today, although practically every known variety of preserve and pickle is found on the market, the distinctive flavor of the homemade product is often preferred. Commercial products, delicious as they are, often lack the flavor obtained in the homemade product. For this reason even those homemakers who do little other food preservation in the home believe it worth while to make a variety of pickles and preserves.

Drying

Removal of moisture is of benefit in preserving food. Although it is difficult to dry foods to the point of destroying microorganisms, it is comparatively easy to dry foods so that no spoilage takes place. All organisms must have food on which to develop, and before the food is available to them it must be in a solution which is rather dilute. These microorganisms obtain food by osmotic action. Drying of foods to prevent spoilage does not necessarily mean complete removal of the water, but it does mean concentration to such a point that the liquid is denser than the body fluid of the organisms. When the liquid outside the cell wall is more dense than that inside, the liquid within tends to be removed from the cell, and body processes are delayed or prevented. Hence, although the food is present it may not be available to the organism which might cause spoilage. Drying may retard enzyme action also, but in vegetables, especially, the effect of enzymes is sufficient to cause comparatively rapid

deterioration. Scalding to destroy the enzymes is highly beneficial in prolonging the storage life of dehydrated vegetables. Drying alters greatly the character of the food and requires some time for preparation both before and after the process. Corn, green lima beans, and apples are among the foods which are most frequently home-dried.

Exclusion of air

The exclusion of air is often effective in extending the keeping period of foods. Olive oil, as well as other oils and many foods containing fats, deteriorates if exposed to the oxidizing action of the oxygen of the air. Still other foods are spoiled by the action of microorganisms which require air for their development. Sauerkraut, dill pickles, and other fermented products must be sealed from the air to prevent the growth of acid-destroying aerobes.

Effects of method of preservation

Each of the methods of preserving food previously presented has a definite effect upon the food. Temperature, in the form of heat, changes the character of the food entirely. With the use of heat, the foods are cooked, and in the case of sterilization of cabbage, spinach, or similar non-acid foods, overcooking is a probable danger. Meats, too, are sterilized only after a long cooking period. Prolonged cooking is undesirable for many foods; hence preservation by the use of high temperature is of limited practical value.

Low temperature (that is, refrigeration) has many advantages over other methods of preserving foods. Food thus preserved, unlike that kept by other methods, remains relatively unchanged, for it is preserved not by destroying the spoilage agents, but by retarding or preventing their action. Modern refrigeration preserves the food without the loss of any substance, not even an appreciable amount of water, and adds nothing to the food, such as preservatives. It does not greatly alter the character of the food in appearance, flavor, nutritive value, or digestibility. However, refrigeration above the freezing point is a more or less temporary measure. Rarely can the perishable and semi-perishable foods be kept in cold storage above the freezing point for a period longer than one year, and often it is for only a few days or weeks. Freezing offers a more permanent method for the preservation of foods. Beef frozen for eighteen years was reported to show no signs of decomposition and was not impaired in digestibility or flavor. From a practical standpoint it is seldom economical to preserve foods for a period longer than from one season to the next, or at a maxi-

mum for more than one year. Early methods used for freezing foods resulted in ruptured cells and impaired texture, and many foods lost their original character. Hence a limited number of foods were frozen and these for certain uses only. Today, improved methods of freezing make possible the preservation of a wide variety of foods by this method without undue change in the nature of the product. The list of such foods now has expanded to include batters, doughs, and precooked food, in addition to the familiar fruits, vegetables, and meats.

The use of acceptable preservatives such as sugar and salt usually results in a food quite different in character from the original. Large quantities of sugar alter the flavor, color, taste, and texture of foods. Salt also has much the same effect. Because the natural state of the food is changed to such a great extent, the use of the preservatives usually results in highly flavored foods of which only small quantities are consumed at one time. This method, then, is limited in its application.

Fermentation, too, produces great changes, as is seen when sauerkraut is compared with fresh cabbage. Few foods in this country other than cabbage and cucumbers are preserved by this method. In some countries, however, a great variety of foods are preserved by fermentation. The product thus produced differs from the original in flavor, color, and often in texture.

Each method has its advantages and disadvantages. One may be desirable for one type of food, and another for other types. The method chosen depends upon a number of factors, important among which are the characteristics of food to be preserved; the nature of the finished product desired; the type of preservation desired, whether temporary or permanent; the cost involved; the equipment available; the time and labor required; and the convenience of using.

PROBLEM 1 *How shall foods be canned?*

Canning is the preservation of foods in hermetically sealed containers through the application of heat. The heat cooks the food, changes the flavor, the physical nature, and often the appearance. It destroys part or all of the microorganisms, and purposes to render inactive any that remain. It also destroys the activity of the enzymes. The hermetic seal

prevents the entrance of organisms from outside sources. The fundamental point in successful canning is to sterilize or render inactive by heat all living organisms on or in the food and everything that comes in contact with it, and then to maintain this condition.

Selecting and preparing the food

The quality of the food is important in the selection of all foods for canning, but particularly the non-acid ones. The spoilage of non-acid foods is largely responsible for botulism, the most serious illness that results from eating canned foods. Other forms of illness are also attributed to the eating of canned non-acid foods which have spoiled. Stale food or that which has started to decay is difficult to sterilize, and the chances of spoilage are great. Canning is not a means of using food unfit for other purposes.

Fruits have the best flavor when mature and ripe; vegetables are best when young and tender. "Two hours from field to can," although desirable for all foods, is most important for vegetables. After harvesting changes occur more rapidly in the flavor and texture of fresh vegetables than of fresh fruits. It is well, then, to select strictly fresh foods for canning and to can them immediately. If a few hours must elapse between harvesting and canning the food should be kept cold.

To obtain an attractive product the food should be sorted as to size, color, or other characteristics, and then prepared for cooking. First, it is thoroughly cleaned. For small vegetables and fruits this is best accomplished by holding the food in a sieve or colander under running water. Cleansing of large vegetables and fruits is hastened by scrubbing with a brush. Meats may be carefully wiped with a damp cloth. Next, such foods as need it are peeled. Tomatoes and peaches are often blanched, that is, dipped in boiling water, then in cold water, to facilitate the removal of the skin (Fig. 126). Carrots may be scraped. Cores or seeds are removed next, if this is necessary. Large pieces are usually halved, quartered, or sliced.

Proportions

As a rule sugar and salt are the ingredients added. The degree of sweetness desired, the use for which the fruit is intended, and the acidity of the fruit influence the proportion of sugar to be used. In home canning, the syrup is often classed as thick, medium, or thin. In laboratory work and in commercial canning, a different method of classification is used; the degree Balling or Brix of the syrup is determined. This is done

by means of a Balling or Brix hydrometer which measures the percentage of sugar in the syrup. A thick or heavy syrup contains about equal parts of sugar and water and tests from 50° to 55° Balling or Brix. A thin syrup may contain one fourth as much sugar as water and tests 25° Balling or Brix. Very thin syrups contain even less sugar. Degrees Baumé may also be determined, but the Baumé hydrometer was designed for use in testing the strength of salt brines; hence for a given syrup the Baumé reading will differ considerably from that on a Balling or Brix hydrometer. When salt is used, the proportion is generally one teaspoon to a quart of food.

Selecting the equipment for each process

Certain equipment is highly desirable for canning food. For cleansing the food, it is useful to have an assortment of brushes, including one with stiff, another with medium, and a third with flexible bristles. Likewise, brushes for cleaning bottles and jars are desirable. A colander or sieve in which to hold the food under running water is also helpful. In peeling the food and otherwise preparing it for cooking, knives of various shapes and a pair of scissors are useful. It is well to have a knife with stainless steel blade for peeling the fruit, one for cutting and slicing, and one for removing the pit or core from various kinds of fruit. Measuring utensils may include a measuring cup, measuring spoons, a pint or quart measure, and scales. The latter are especially valuable in making preserves, jams, and similar products where weights are used instead of measures. For measuring the density of syrups a saccharometer may be used, and for determining the percentage of salt in brine a salinometer. It is doubtful if these last two are often a part of the home equipment. A jelmeter is an aid in determining the pectin content of juices, and a thermometer in determining when jellies, jams, and marmalades have reached the right concentration. For scalding or blanching foods, a large utensil to hold the water and a wire basket or a sack to hold the foods when dipped in the water are useful. A wide-mouthed funnel and a cup-like ladle for pouring liquids are also convenient for filling the containers. Jar tongs which grip the container firmly and do not slip are almost an essential in handling the hot jars. If screw-top glass jars are used, a wrench made for tightening the lids facilitates the sealing of the jars. Cherry pitters, rotary peelers, and cutting and dicing equipment are also helpful if one does not object to the greater investment. A utensil in which to cook or process the food may be the most expensive piece of equipment. For fruits and tomatoes, a large preserving kettle may be used. For process-

Courtesy of Ball Brothers Company, Inc.

Fig. 125

Equipment shown here makes for ease and efficiency in food preservation.

ing meats and non-acid vegetables, a pressure cooker or canner is essential, and this may involve considerable expense. If it is purchased cooperatively by a number of families, the expense to any one family need not be prohibitive. It is important to maintain a uniform temperature throughout the processing period, and this is much more easily done if the cooker is not too small. A cooker having a capacity less than eighteen quarts is said to be difficult to maintain at a uniform temperature. On the other hand, one much larger than this is difficult to handle because of its size and weight. Acid foods may be processed at the temperature of boiling water; hence a regular hot water bath, a good-sized bucket, a large kettle, or a boiler may be used for these. A rack to keep the jars from setting on the bottom of the utensil is necessary. The utensil should be deep enough so that the jars are covered by two or three inches of water during processing.

All of the utensils used should be of materials which are not affected by the foods. Aluminum, stainless steel, glass, enamelware, and wood are suitable materials. In purchasing this equipment one may well consider that few if any pieces will be used at the canning season only. Fruits and

vegetables are prepared for the table throughout the year, and most of the articles convenient for use in the canning season are convenient at all times. Needless to add, plenty of towels and dishcloths, a chair or stool on which to sit, and adequate table space are essentials for rapid and efficient work.

Selecting the containers

The choice of the container is important. Either tin or glass may be used. Tin cans ordinarily require more equipment for sealing than do glass jars; a mechanical sealer is required for the type of tin can now most widely used. Tin cans are less expensive to purchase than glass jars, and with care may be used more than one season. There is no danger of breaking them either in processing or handling, and the seal is fairly sure. In the sanitary type of tin can the entire top is open so packing is easier than in some glass jars. The older type of can, with cap and hole, had only a small opening and was difficult to pack. Tin containers have a decided advantage over glass as to storage since they require less space. They also protect the food from light; hence, they need not be stored in a dark place. In sterilizing under pressure the steam can go on and off quickly without danger of breakage or loss of liquid. The cans may be cooled rapidly in a cold water bath, the loss from thermophilic bacteria thus being decreased and danger of overcooking minimized.

Glass jars are a greater initial expense than tin containers, but they may be used for many seasons. Only the sealing device need be replaced. Glass jars are breakable, but with care the loss is usually small. Glass displays the food, setting a premium on attractive packs. A feeling frequently exists, apart from any scientific support, that there is a higher degree of sanitation in foods packed in glass. On the other hand, many women prefer tin to glass for canning certain foods, especially tomatoes. There is no real scientific basis for either preference from the standpoint of keeping quality, but in the case of tin there may be less loss of color due to fading.

Containers have three major parts; the container proper, the cover, and the sealing medium. Tin containers have tin covers. The sealing medium first used was a form of sealing wax which was melted and poured around the opening of the can. Later, solder was used. Today the sanitary tin cans have a continuous ring of sealing compound around the edge of the covers. This melts when heated and flows into any open spaces, effecting a seal.

Glass jars have either glass or metal covers. The glass covers are held

in place with a clamp or a screw ring. Rubber rings form the seal. The lightning seal type of jar is frequently used. It is equipped with a clamp or bail. The lid of the jar has a notch in the top. When it is in place the bail can be brought up over the lid and snapped into place without undue effort. When the attached lever is pushed down, the bail tightens and holds the lid on securely. If the bail is not adjusted properly it may be removed and tightened by being bent downward or loosened by being bent upward. It may also prove necessary to bend the sides of the bails together slightly.

The screw-top or mason type of jar has long been in common use. It may have a zinc porcelain-lined cover with shoulder rubber ring; a glass lid with top-seal rubber ring, held in place by a metal screw band; or a flat metal lid edged with sealing compound held in place by a metal screw band.

Other types of glass jars are found on the market. Often there is little or no choice in the type of jar to be purchased, for only one kind may be available. When possible, it is best to select a type that is in rather general use, for less difficulty will be experienced in replacing the covers.

Glass-covered jars are unaffected by foods. The gold-lacquered lids, too, are said to be unaffected. Zinc, on the other hand, is subject to the action of acid. Frequently the zinc lids of jars containing pickles or other acid foods are perforated by the action of the acids. Glass covers do not wear out, so need not be replaced unless broken. They are free from crevices and are more easily cleaned than zinc screw-top lids. However, if the metal lids are used only once, they are satisfactory covers for jars from this standpoint.

When rubber rings are used to effect a seal they should be of live rubber, that is, pliable and elastic as contrasted to brittle and inelastic. A live rubber ring when creased firmly between the thumb and finger will show no mark when released. Rubber rings should not be stretched.

A container with a simple sealing device should be selected because any delay in sealing the sterilized food increases proportionately the chances for spoilage. Consideration should also be given the shape of the container. Tin cans may be tall or flat; glass jars may be round or square with either small or wide mouths. Tin cans may be plain or enameled. The "C" enamel finish is adapted to such foods as corn and lima beans, and the "R" enamel finish is particularly suited to the red fruits and such vegetables as beets or pumpkin. The choice of tin cans should be made on the basis of the food to be canned. If glass jars are used the glass should be clear, and the color should be such as not to spoil the appearance of the food.

Methods of canning

Two methods of canning are commonly practiced, the open-kettle method and the can-cooked method. The open-kettle method, as the term implies, is the cooking of food in an ordinary kettle, packing it while boiling hot into hot sterilized jars and sealing immediately with sterilized lids. In the can-cooked method the foods are packed in the container, either glass or tin, and then processed or cooked.

Open-kettle canning

The character of the food determines the desirability of using the open-kettle method of canning, which cannot be successfully applied to all types of food. Under ordinary conditions of cooking, a temperature greater than the boiling point of water is not reached. It has already been noted that the sterilization of non-acid foods requires a temperature above 100° C. (212° F.) or else the maintenance of this temperature for great lengths of time. Since this cannot be satisfactorily accomplished in the open kettle, non-acid foods are not successfully canned by this method. Open-kettle canning is thus limited to acid foods such as fruits, tomatoes and such non-acid vegetables and meats as may have acids added. Often it is recommended for pickles only.

Advantages and disadvantages

The open-kettle method is suited to canning small quantities of fruits, for it requires little equipment. Some means of thoroughly washing the food, a kettle in which to cook the food, a utensil in which to sterilize the containers, a measuring cup, a sharp knife and a large spoon may be sufficient in this case. It is also a comparatively quick method. The containers are more nearly filled than by the other method. It has many disadvantages, and for ordinary canning purposes it seems to be giving way to the can-cooked method. Anyone familiar with open-kettle canning may recall the delicious odors given off during the cooking of the food for the food must be completely cooked before being packed in the container. When these odors are liberated, a certain amount of the natural flavor of the food is lost. Rapid boiling while cooking is apt to cause some disintegration. This is particularly true of the soft foods which break up badly. It is difficult to transfer a soft mushy product from the kettle to the container. As a result an attractive pack is not readily obtained, and the canned food may be of low quality. Exposure of the foods to the air during cooking tends to cause loss of ascorbic acid, particularly in non-acid foods. However, in the case of tomatoes at least, there is no general evidence that

this vitamin is preserved better by one method than another when canned in the home. Most important of all the disadvantages of the open-kettle method is the greater danger of spoilage. Any delay in sealing the jar may permit molds or other microorganisms to enter and to cause the contents to spoil. Even if only the food in the top of the jar is moldy, there is some loss, and the worker lacks the feeling of satisfaction that comes with a job well done.

Preparing, packing, and sealing the containers

The containers, including the lid and sealing medium, should be placed in water and heated to boiling. If the jars have had spoiled food in them, they should be washed thoroughly, using a brush, hot water, strong soap and washing soda, then covered with water and boiled for 15 minutes. If desired, washing soda may be added to the water in which they are boiled. While the containers are being heated the food may be cooked. It should be thoroughly cooked, yet not overcooked. The containers should be removed from the water shortly before they are to be filled. If allowed to stand open to the air they may be contaminated. There is also danger of breakage when the hot food touches the glass. The food should be packed quickly and systematically into the container. Care should be taken to have the container as full as possible; otherwise the unsterile air left in the jar may cause spoilage. The containers should be sealed just as soon as filled and then cooled as rapidly as is practicable; drafts should be avoided if glass containers are used. After the containers are cooled it is well to wipe them clean, then examine them carefully to be sure the seal is retained. They may then be labeled as to contents, dated, and stored in a cool, dark, dry place.

Can-cooked canning

The can-cooked method of preserving foods has a much wider application than the open-kettle method of canning. As stated before, the foods are packed in the container, either glass or tin, and then processed or cooked. After being packed with the prepared food, the container is sealed partially or entirely, heated for a given period, then completely sealed, if this has not been done previously. If properly carried out, this method gives no opportunity for contamination between cooking and sealing. It is the only method recommended for meats and non-acid vegetables. Can-cooked products retain quite well their natural flavor and shape, although the color is not always good.

Can-cooked foods may be packed into containers either cold or hot.

The processes are designated accordingly as raw-pack or hot-pack canning. Raw-pack canning consists in packing raw, prepared material into jars or cans, heating in a hot water bath until the contents of the can have reached 170° F., adding hot water if needed to fill the container, partially or completely sealing according to type of container, then processing or cooking, and finally sealing if this has not already been done.

Hot-pack canning is now highly recommended for practically all foods, although the Bureau of Human Nutrition and Home Economics reported certain advantages in cold-pack or raw-pack canning of snap beans. With hot-pack canning, a short precooking period precedes packing the hot food into the container. Precooking consists in heating the material for a short time in steam or in boiling liquid in order to shrink or wilt it. The precooked food is then packed boiling hot into hot containers and processed immediately. This method reduces air in containers to a minimum and shortens the time required to reach the desired temperature for processing.

To prepare fruit for hot-pack canning add sugar, syrup, or water as desired, and heat thoroughly but do not cook until soft. Precook vegetables in steam or in water. Steaming eliminates, to a large extent, the loss of soluble elements into the water. It may, however, increase the loss of natural color of foods, just as cooking certain vegetables, especially green ones, in a covered utensil tends to destroy the color. Steaming a vegetable may also cause a greater change in the flavor than results when it is boiled in an uncovered kettle. Meat may be precooked by any method desired, but the method recommended by the Bureau of Human Nutrition and Home Economics is to put the meat in a large shallow pan with just enough water to prevent sticking, then cook slowly with occasional stirring until medium done. It is usually advisable to avoid adding flour, which soon becomes stale in flavor. Precooked foods are packed hot, a valuable aid in processing.

Processing consists in heating food in cans or jars to the point where it will keep. It is generally done in a water bath or pressure canner, although a steamer may be used for acid foods. Processing kills the bacteria and sterilizes as nearly as possible the contents of the container. Complete sterilization is often not realized, and certain heat-resistant aerobes may survive the processing period. Due to unfavorable conditions for growth they may remain dormant in the processed container and cause no difficulty. The utensil in which the cans or containers of food are heated is the processor or canner.

Processing should be sufficiently prolonged to insure that the food will

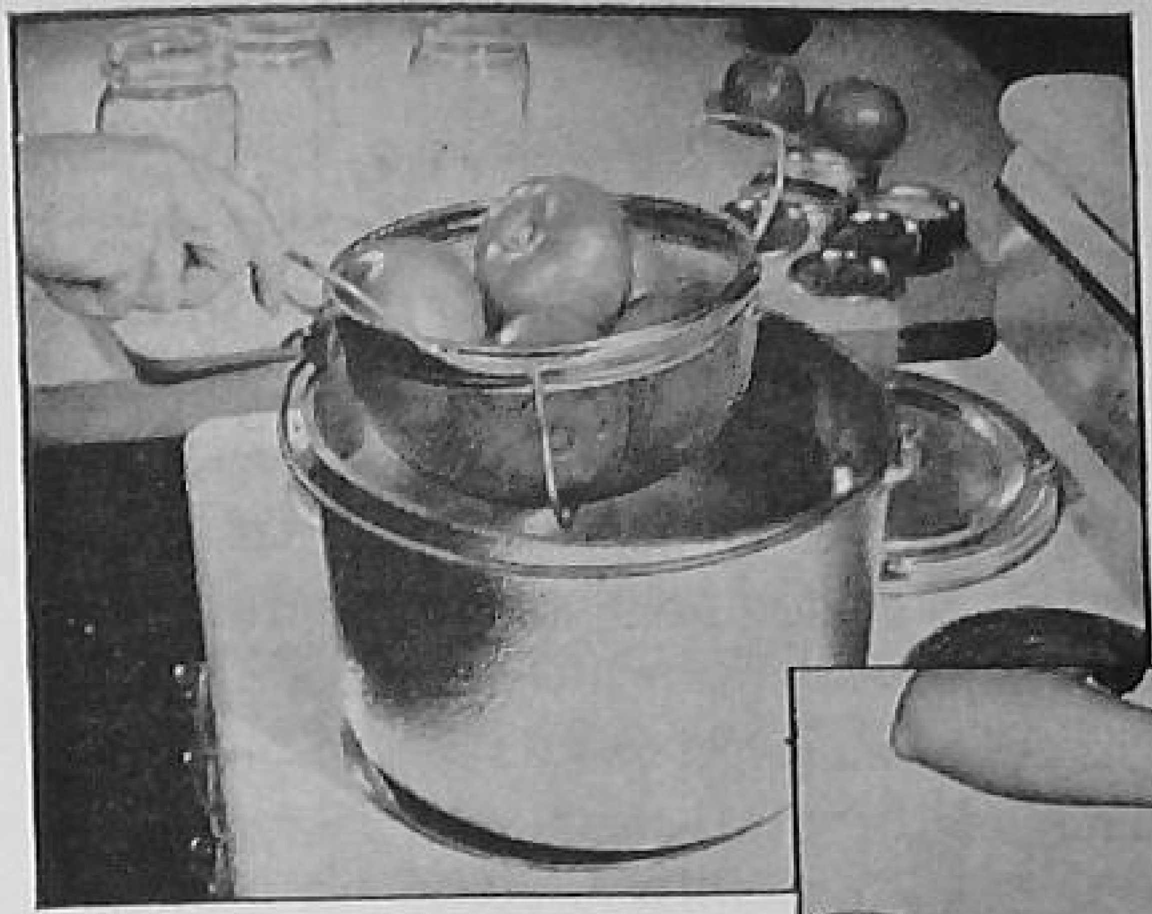
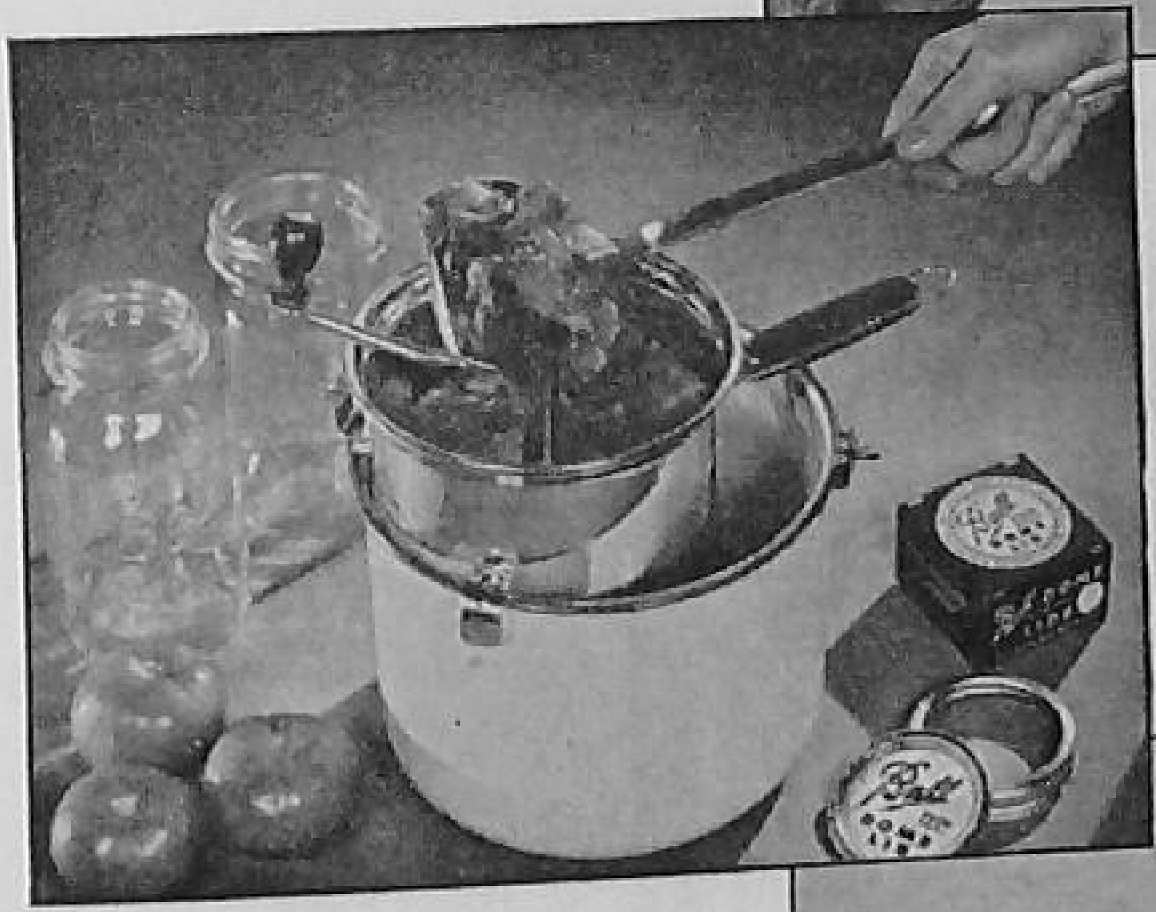


Fig. 126

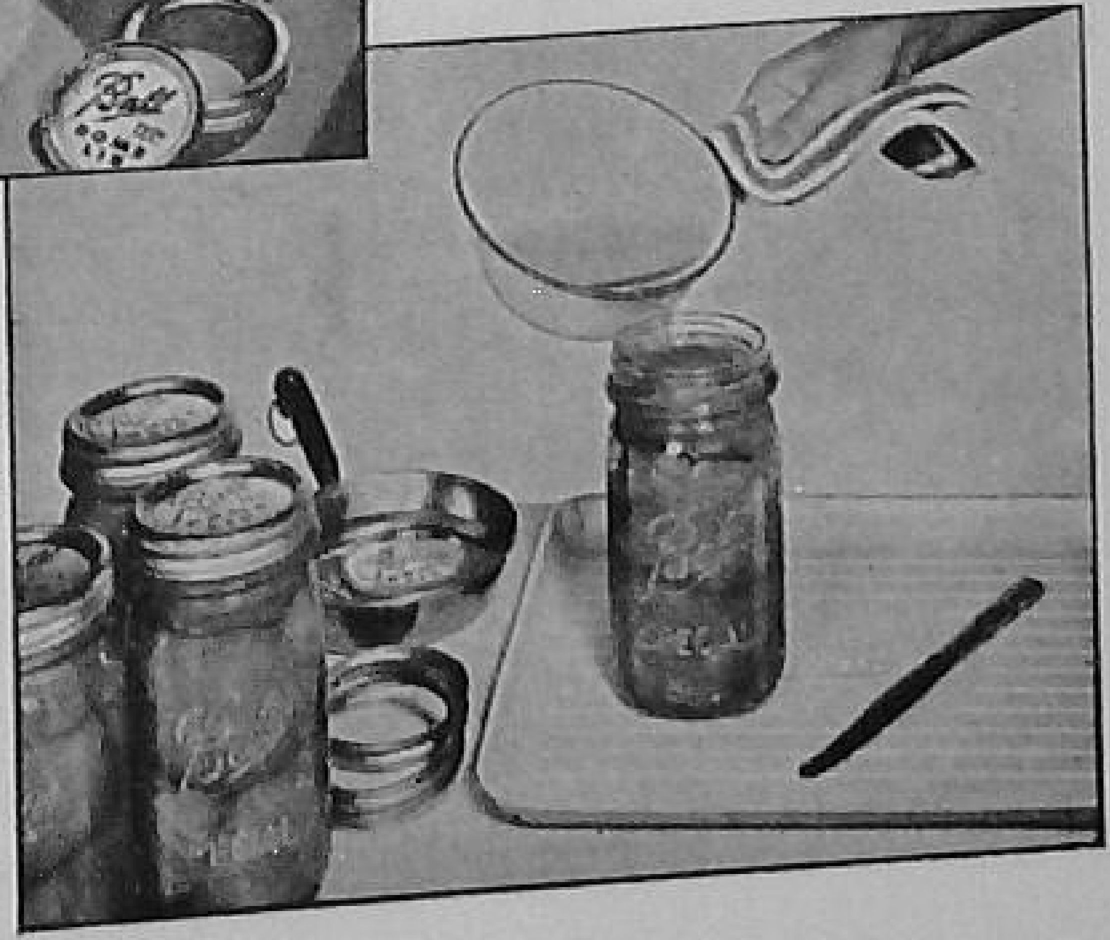
To can tomatoes: Use fresh, firm, red-ripe tomatoes, free of evidence of spoilage. Wash tomatoes . carefully. Scald a few at a time to loosen skins, then dip in cool water.

Cut out all core and green spots. Skin and pack immediately. For whole tomatoes use small fruits and pack as closely as possible without crushing.



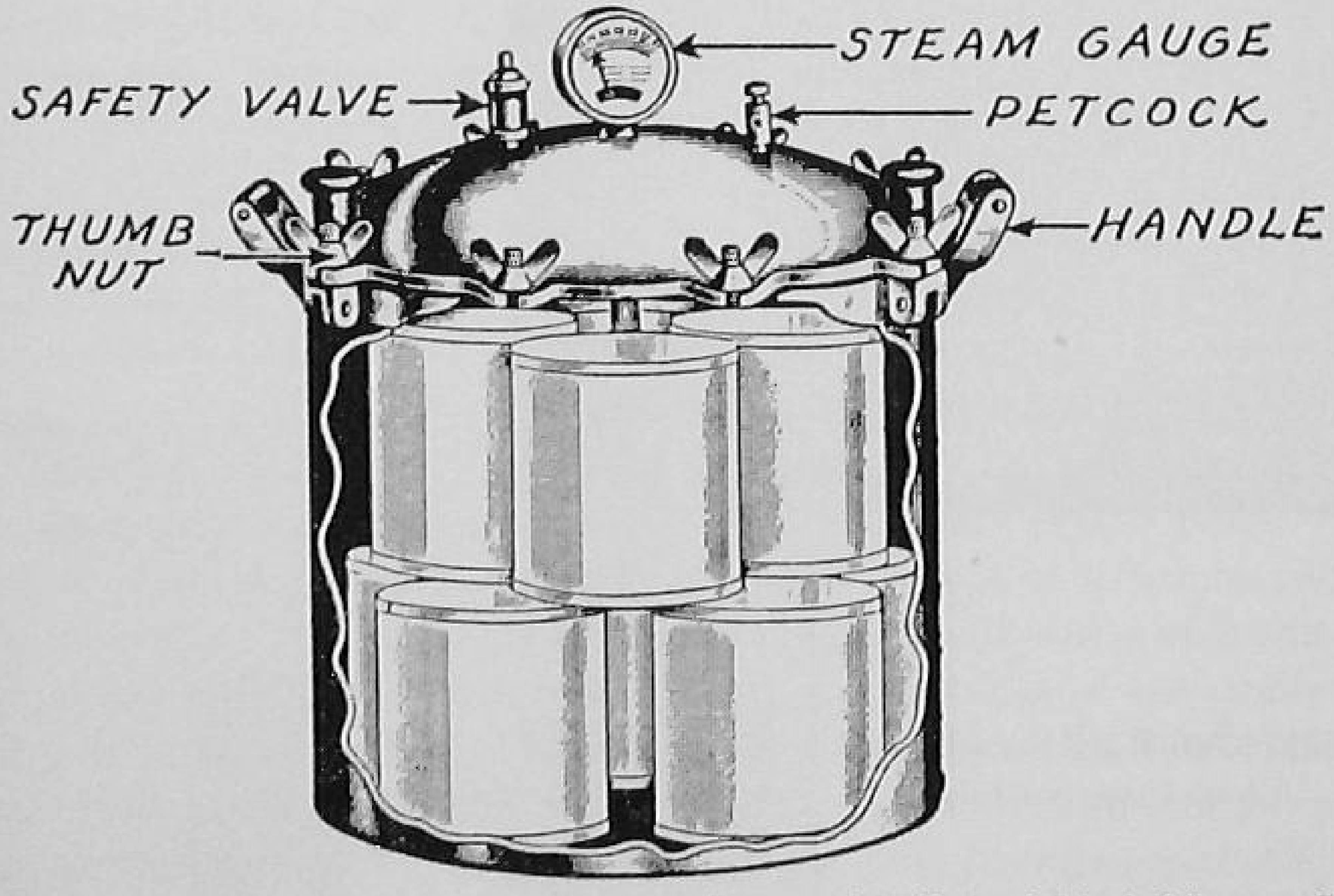
Remove cores and blossom end from firm, fresh, red-ripe tomatoes which have been carefully washed. Cook. Press through fine sieve or food mill to make juice to can "as is" or to use to fill spaces between tomatoes packed for whole processing.

Add one teaspoon salt to each quart. Cover tomatoes with hot juice.



Courtesy of Ball Brothers Company, Inc.

keep, but should not be continued longer than is necessary, or an overcooked product results. There is an interplay between the time and temperature in processing. Processing at 250° F. is about a hundred times as rapid as at 212° F. Other conditions such as the freedom of the food from gross contamination and the composition of the food are also important. It is thus necessary to consider the characteristics of the food to be canned in determining the processing period. Foods of high quality, free of molds and decay, are much more readily sterilized than are unsound foods. Pasty or semi-solid foods, as corn, pumpkin, and sweet potatoes, are poor conductors of heat; hence the center of the can becomes hot much more slowly with these foods than with those in a brine or syrup, as are peas, peaches, and similar foods. A very heavy sugar syrup, on the other hand, may retard heat penetration. Large containers require a longer processing period than small ones, and foods in tin containers usually heat more rapidly than do those in glass jars. The acidity of the food is perhaps the chief factor influencing the time required for sterilization. All of the common fruits and tomatoes contain enough acid to make them easily sterilized at 100° C. (212° F.). Vegetables and meats low in acid are much more difficult to sterilize. In fact, they are so difficult to sterilize that it is recommended that they be canned only when a processing temperature



Courtesy of the National School of Pressure Cooking

Fig. 127

The pressure cooker of the type commonly used in canning is essentially simple.

considerably in excess of that obtained in boiling water is available. In other words, when a pressure canner is not available for processing these foods, it is wise not to attempt to preserve them by canning.

Because so many conditions affect the processing time necessary for preservation of various foods, the only safe procedure is to follow exactly the methods given by some reliable source, such as government bulletins.

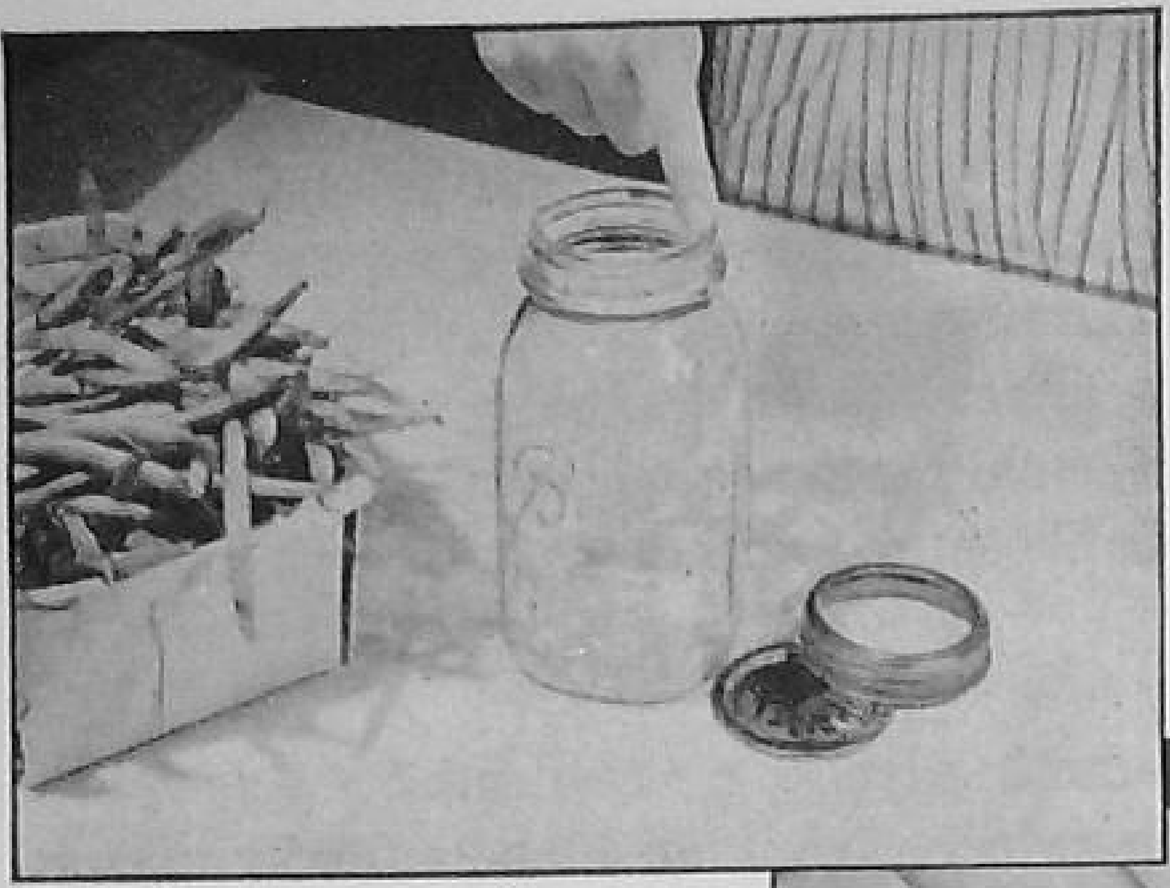
Advantages and disadvantages

The can-cooked method has both advantages and disadvantages over the open-kettle method. The greatest advantage is undoubtedly its suitability to the preserving of every type of food that is canned. It is satisfactory for canning acid foods, and it is the only approved method for canning non-acid foods. The processing of the entire contents of the can insures the sterilization of any enclosed air as well as of the food. Therefore, there is little danger of molds developing on the top of the can, as often happens in open-kettle canning. When a quantity of food is to be canned, it can be done more quickly and more efficiently by this method. There is no danger that the food will boil over, as frequently happens when cooking is done in an open kettle. Hence, it is not necessary to keep constant watch while processing in the hot water bath, although it is important to see that the pressure canner maintains a uniform pressure. As a rule, more attractive packs can be obtained by the can-cooked method because a premium is not placed on speed of packing and sealing as it is in open-kettle canning. Furthermore, can-cooked foods tend to retain their natural flavor and odor and their original shape much better than open-kettle canned foods.

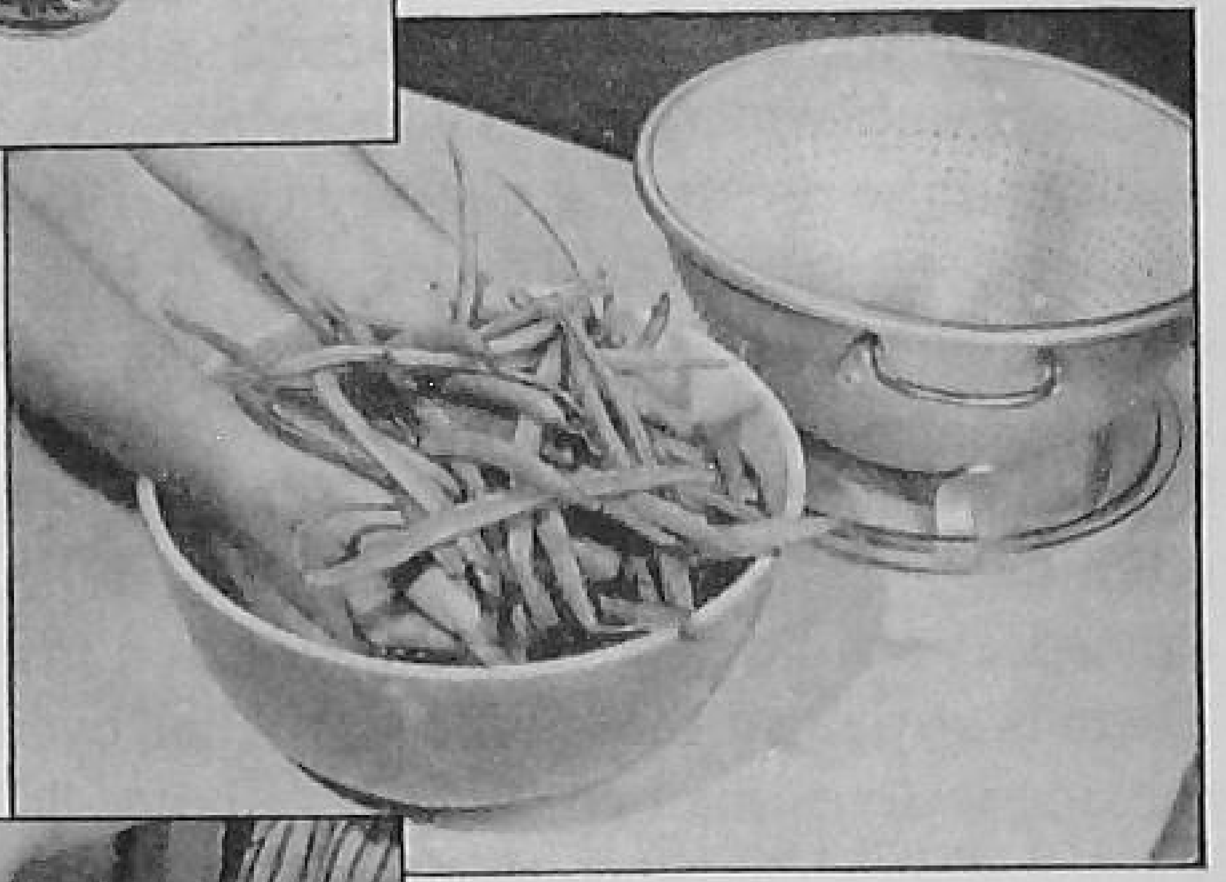
Equipment

On first consideration it is probable that the equipment necessary seems the greatest disadvantage of the can-cooked method. One is apt to picture the hot water bath as a wash boiler or other container of enormous size, the steamer as a huge utensil constructed for this purpose only, and the pressure cooker as a heavy unwieldy piece of equipment. However, such need not be the case. A kettle, deep enough for the containers to be well covered with water, and fitted with a tight lid, or a steamer useful in everyday meal preparation, or a pressure cooker small enough to permit easy handling and frequent use; any of these is suitable for canning by this method. Pressure saucepans, too, are being recommended by the manufacturers for use in canning. Due to the rapid rate of heating and cooling, the recommended processing time differs from that given for the steam

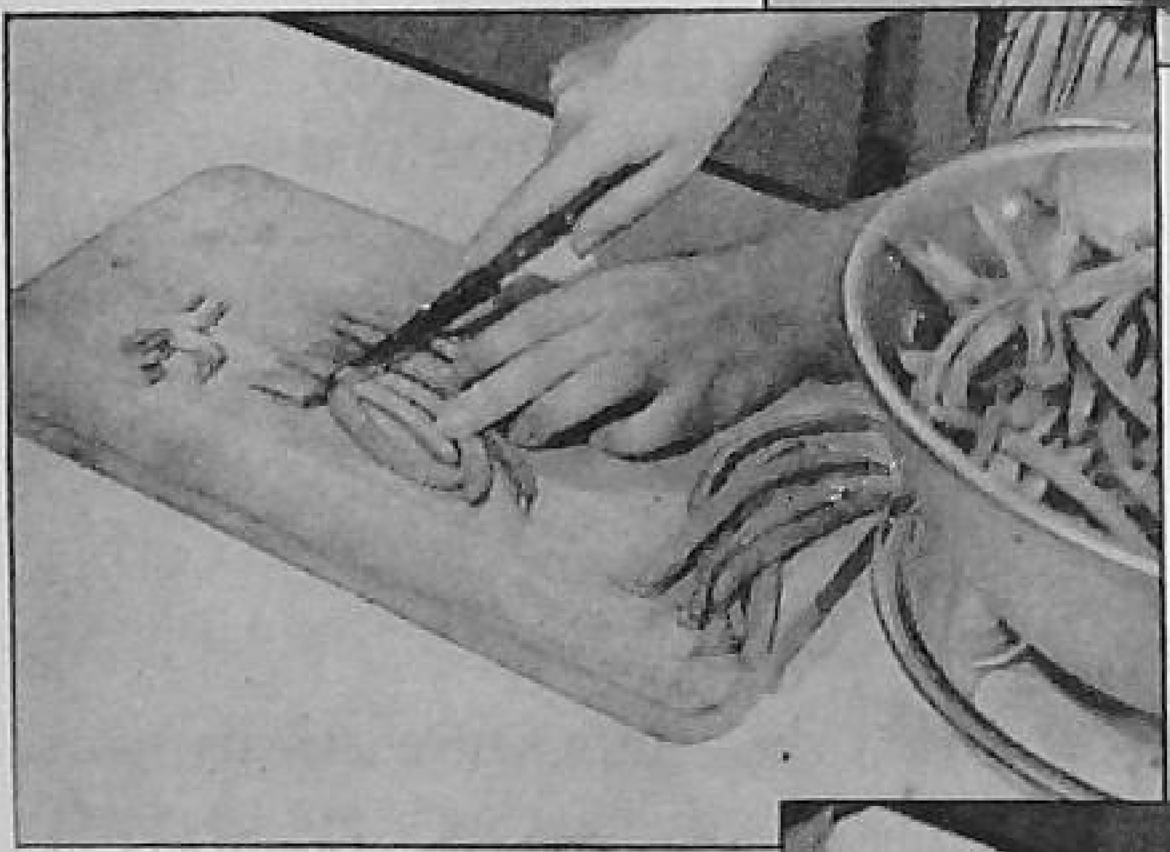
Fig. 128



To can green beans: Examine top of jars to see that there are no nicks, cracks or sharp edges; wash in hot soapy water. Rinse. Leave in hot water until ready to fill. Use new lids and good bands. Wash and rinse. Cover lids with boiling water; leave in water while filling jars.



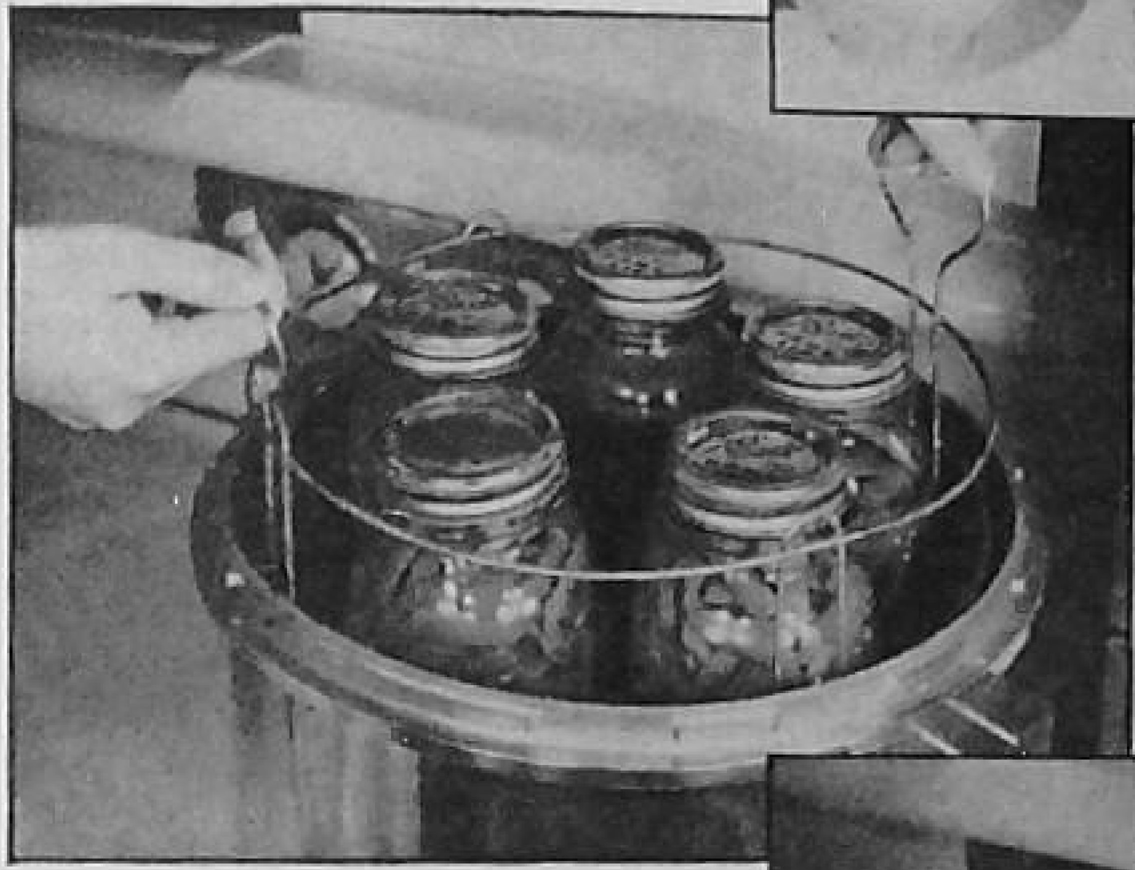
Thoroughly wash freshly gathered beans. Lift them out of water; rinse and drain.



Trim ends and cut into desired lengths, handling several beans at a time. Cover beans with boiling water. Boil 3 minutes. (The short cooking may be eliminated if desired according to work at the Bureau of Human Nutrition and Home Economics.)

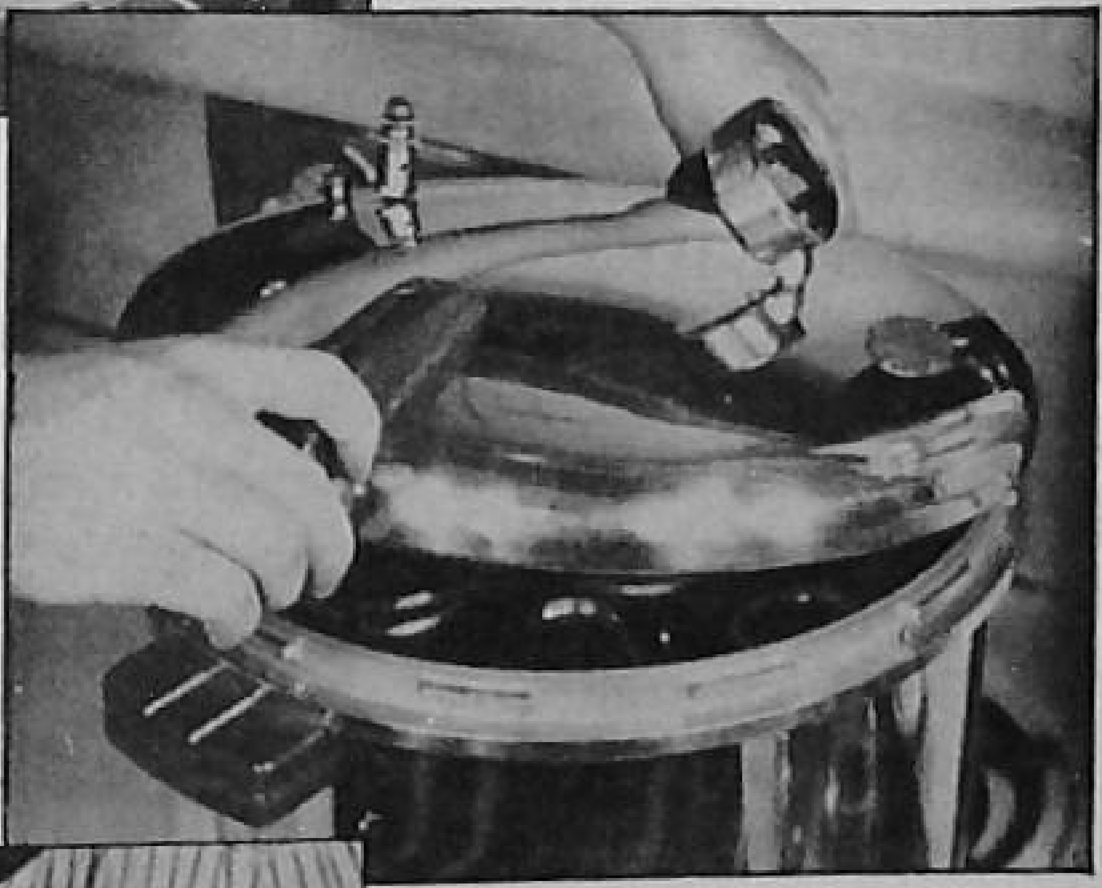
Fill one hot jar at a time. Leave a ½ inch head space when filling jar. Add 1 teaspoon salt to each quart container and boiling water to cover beans.

Wipe top and neck of jar. Put lid on jar with sealing compound next to glass. Screw band down evenly and tightly to hold lid securely in place.



Put jars into steam pressure canner containing 2 or 3 inches of hot water or amount recommended by the manufacturer.

Place canner over heat. Lock cover according to manufacturer's instructions. Leave petcock or vent open until steam escapes for 7 to 10 minutes. Close petcock. Bring pressure to 10 pounds.



Courtesy of Ball Brothers Company, Inc.

After processing for recommended time, remove canner from heat. Let pressure fall to zero. Wait 2 minutes, then slowly open petcock. Open canner. Remove jars. Do not tighten bands. Stand jars several inches apart and out of draft to cool. When cold remove bands. Test seal. If lid is slightly concave (curved inwardly) jar is sealed.

pressure canner. Work at the Bureau of Human Nutrition and Home Economics leads to the recommendation that pint jars of vegetables heated in the pressure saucepan should be processed twenty minutes longer than those processed in the pressure canner.

Sealing the container at the high temperature which it has reached when removed from the canner is difficult, especially with screw-top jars with rubber rings. Such difficulty may be overcome by the use of the all-glass lightning-type jar, which has only the short wire to push down after processing; or the type of jar with the flat metal lid edged with sealing compound, held in place with a metal screw band which may be tightened before processing. Obtaining a full can of food may also be a problem. Unless the food is thoroughly precooked, shrinkage occurs within the can, so that it is only partially filled. Loss due to breakage sometimes occurs when glass jars are used. This usually results either from flaws in the jars or from incorrect methods of handling.

Preparing and packing the containers

Cans or jars for can-cooked canning should be heated to the boiling point in water. Hot food should be packed into the hot containers quickly and as a rule not too tightly. On the other hand, too loose a pack and the excessive shrinkage of certain foods result in partially filled containers, particularly in the case of foods high in water which have not been precooked sufficiently and which tend to shrink when processed. Foods, such as peas and shell beans, which tend to swell during cooking should be packed loosely; otherwise incomplete sterilization results. Corn, sweet potatoes, and other foods that pack tightly into the can should be weighed to avoid overpacking. These foods are poor conductors of heat and, unless free liquid is present, may be incompletely processed. Hence care is required to obtain a pack of just the right consistency.

After the containers are filled, the covers are placed on them. As a rule, foods are packed boiling hot in tin cans and are sealed immediately. Thus little or no expansion takes place during processing. The lids on glass jars are held in place, but the jars are ordinarily not sealed; this permits escape of excess steam as it forms during processing. Zinc tops are screwed down so that they just touch the rubber, or they are tightened as securely as they can be with a thumb and finger, or they are tightened and then loosened one fourth of a turn. The flat metal lid edged with sealing compound is held to the jar by screwing the metal band on firmly. No further tightening is needed. The sealing of this type of jar does not take place until the compound is melted by heat and later solidified by cooling. The

lightening-seal or "all-glass" jars, that is, glass jars with glass tops held in place by means of a wire bail, may be "fully sealed" for processing. In other words, the wire bail may be in the tightened position. Actually, study shows that at this stage the jar is not fully sealed, for when sufficient pressure develops in the jar the lid lifts slightly, allowing steam to escape. However it is more commonly recommended that only the wire bail over the lid be in place before processing.

Processing and sealing

The filled containers may be processed in the hot water bath, steamer or pressure canner. The water bath is the simplest and cheapest type of canner. It consists of three essential parts — a kettle, a rack, and a tight cover. The kettle should be deep enough to permit one to two inches of water over jars and a one- to two-inch space for brisk boiling. It should be fitted with a perforated, false bottom or rack on which to place jars. This permits water to circulate freely about jars. The steamer, like the water-bath canner, should be used only for canning acid foods and is recommended only if a steady, strong current of steam is generated by use of an extremely hot fire. If circulation of steam is good throughout the processing period, the temperature surrounding the cans should be that of boiling water, and theoretically the processing time for a steamer should be the same as for a water bath. In actual practice, longer processing periods are usually recommended because of uncertainty concerning amount of steam circulating. An increase in time of one fifth to one fourth has been suggested. The steamer is easy to manipulate, as it is light to handle, and there is no direct contact with water. Foods canned in it retain shape and color well. The pressure cooker or canner is essential for canning non-acid foods, as meats and vegetables, which require a high temperature to make sure of killing the organisms that cause dangerous spoilage. The only practical way to get this high temperature is to use a pressure canner. By holding steam under a pressure of 10 pounds, a temperature of 240° F. is obtained. The Bureau of Human Nutrition and Home Economics recommended 240° F. for all non-acid foods. It is important that the gauge on the canner be checked periodically to make sure that it is working properly and this pressure is actually maintained. A uniform pressure is also necessary if the results are to be satisfactory.

Each food has a specific processing time as indicated in Table 70. Exact directions have been developed for the preparation, packaging and processing of each food and these should be followed in detail. Immediately after processing, the covers of all-glass jars not sealed before processing

TABLE 70. TIME FOR PROCESSING VARIOUS FOODS IN QUART JARS *

Product	Processing Period in Boiling Water	Processing Period in Pressure Canner at 10 Pounds Pressure (240° F.) †
Apples	15 minutes	
Apricots	25 minutes	
Blackberries	20 minutes	
Cherries	25 minutes	
Peaches, soft	25 minutes	
Peaches, firm	35 minutes	
Pickled beets	30 minutes	
Pineapples	30 minutes	
Tomatoes	45 minutes	
Asparagus		55 minutes
String beans		25 minutes
Baby beets		55 minutes
Corn, whole grain ‡		85 minutes
Greens		70 minutes
Okra		40 minutes
Peas, green		40 minutes
Pumpkin, cubed		90 minutes
Sweet potatoes, wet pack		90 minutes
Meat, depends on kind		65–135 minutes

* For exact methods of canning see State Extension or U.S.D.A. publications.

† If a pressure saucepan is to be used, follow directions for processing given in government publications.

‡ Corn, cream style, should be canned in pint jars and processed for 85 minutes at 10 pounds pressure.

should be tightened. Zinc tops should be tightened and checked to make sure there is a seal. Jars sealed by a sealing compound should not have the screw bands tightened or the melted compound will be "squeezed" out of place and thus no seal will be formed.

Quantity of canned product from fresh food

The ratio of uncooked to canned products varies with the type of food. It is often helpful to know approximately the quantity of canned food which may be obtained from a given amount of the uncooked product. Table 71 indicates the approximate quantity.

Causes of inferior products

Discoloration of foods, such as peaches, may be the result of not destroying the enzymes. Such discoloration occurs in the presence of oxy-

gen. Ascorbic acid may be added to prevent discoloration of such fruits as peaches and apples but properly processed canned fruits should not need it. Often fruits float in the liquid. The character of the fruit is largely responsible for this condition; strawberries and other extremely soft juicy fruits are likely to float. Too much liquid in proportion to the fruit is sometimes the reason. Overcooking so that the fruit is soft and mushy may cause it to float. Too heavy a syrup, with a density much greater than that of the fruit, is another cause.

Fading of fruits is usually due to exposure to light, although some fruits, as strawberries, always lose their attractive color when canned. Foods canned in glass jars should be stored in a dark place. Particularly is this true of red foods.

TABLE 71. APPROXIMATE YIELD OF HOME-CANNED PRODUCT FROM RAW FRUIT AND VEGETABLES *

Product	Amount of fresh product needed to can 1 quart	No. pints or quarts of canned food to one bushel or crate	Approximate weight or measure of 1 bushel † or crate
Apples	2½–3 pounds	16–20 quarts	48 pounds
Berries (not strawberries)	5–6 cups	12–18 quarts	24 quart crate
Cherries, as picked	5–6 cups	22–32 quarts	56 pounds
Grapes	2½–3 pounds	16–20 quarts	48 pounds
Peaches	2–2½ pounds	18–24 quarts	48 pounds
Pears	2–2½ pounds	20–25 quarts	50 pounds
Pineapple	2 fruits	15 quarts	1 crate or 30 pineapples
Plums	2–2½ pounds	24–30 quarts	56 pounds
Strawberries	6–8 cups	12–16 quarts	24 quart crate
Tomatoes	2½–3 pounds	15–20 quarts	53 pounds
Asparagus	2–3 pounds	8–12 quarts	24 pounds
Beans, lima in pods	4–5 pounds	6–8 quarts	32 pounds
Beans, snap	1½–2 pounds	15–20 quarts	30 pounds
Beets, without tops	2½–3 pounds	17–20 quarts	52 pounds
Carrots, without tops	2½–3 pounds	16–20 quarts	50 pounds
Corn, sweet in husks	6–16 ears	8–9 quarts	35 pounds
Greens	2–3 pounds	6–9 quarts	18 pounds
Peas, green in pods	2–2½ pounds	12–15 pints	30 pounds
Squash	2–2½ pounds	16–20 quarts	40 pounds
Sweet potatoes, fresh	1⅓–1½ pounds	35–40 quarts	55 pounds

* Mainly from **Home Canning of Fruits and Vegetables.** U.S D.A. AIS–64.
† Legal weight varies in different states. Average weights are given.

There are, in addition to these, certain other causes for inferior products in can-cooked foods. The failure to obtain jars completely filled may be due to too loose a pack for the type of food. Often it is practically impossible to get a tight pack unless the foods are precooked, in which case the shrinkage occurs outside of the container.

Lack of liquid in the jar may be due to a tight pack that leaves no room for added liquid, though too tight a seal is sometimes the cause. As the steam forms, considerable pressure is developed before it can escape, then part of the liquid escapes with it. When a pressure cooker is used, extreme fluctuation in the pressure is likely to cause the liquid to escape. As the pressure is lowered rapidly, steam rushes from the unsealed jar together with liquid. Air pockets left in the jar during packing are another cause.

Spoilage of canned food

Spoiled canned foods may differ in odor, flavor, and appearance from canned foods of good quality, and the container also may be affected. Tin cans frequently exhibit more or less swelling due to the formation of gas. A "swell" or a "hydrogen swell" is a can with bulging ends due to the formation of considerable gas, in the first instance by microorganisms and in the second by chemical reaction. A "springer" is a mild swell or hydrogen swell, and a "flipper" is a can in which only a small amount of gas has formed. "Flat sour" is a type of spoilage caused by growth of microorganisms with the formation of no gas. The food usually tastes sour and may have a sour odor. "Leakers" are cans in which the seal is broken for any one of several reasons, among which are improper sealing either at the factory or the cannery, perforation from the inside, and rusting of the outside of the can.

Botulism is the term applied to a type of food poisoning caused by the toxin of the *Bacillus botulinus*. This term was applied to a particular food poisoning early in the nineteenth century. In its early history botulism was associated with the eating of spoiled meats, but more recently vegetables seem to have been the chief bearers of the toxin. Although both commercially canned and home-canned foods have been responsible for outbreaks of botulism, in recent years only home-canned foods have been found to be the source. The home-canned foods responsible for the outbreaks of botulism, listed in order of number of outbreaks caused, are green beans, corn, pork products, spinach, asparagus, beets, peppers, beef products, seafoods, pears, apricots, figs, okra, chicken, and beans. The spores of the organism have been known to withstand heating to 212° F. for as long as five hours.

It is never wise to taste home-canned meats and vegetables before heating. Boiling destroys the toxin produced by the *Bacillus botulinus*, the most serious of the poisonings encountered in canned foods. Hence if the food is boiled for some little time before tasting (meat, corn, and spinach for 20 minutes and other non-acid vegetables for 10 minutes), there is little danger of botulism. On the other hand, the use of the home-canned foods listed above in the preparation of salads, without preliminary heating, may prove disastrous.

Causes of spoiled products

Most of the spoilage in canning is due to failure to process adequately the food or the utensils with which the food is in contact. Excess contamination is usually considered to require a longer heating. Containers which do not give a tight seal cause food to spoil. Delay in sealing the containers after the food is processed produces food spoilage. Storage of the food in a warm place greatly increases the percentage of spoilage. This spoilage is undoubtedly due to failure to sterilize the foods in the first place. In the use of the can-cooked method, failure to sterilize the food, despite the use of approved methods, may result because the food is packed too tightly in the container, because the food is allowed to stand too long before canning and is high in bacterial content, because the length of the processing period is counted incorrectly, or because the processor is not at the proper temperature. Improper manipulation of the packed food outside of the processor is sometimes responsible for spoilage. Allowing packed hot food to stand for some time before processing encourages the development of thermophilic bacteria,[1] and souring frequently occurs. The same type of spoilage sometimes occurs in certain foods after canning if the containers are not cooled in a reasonable length of time. So important is quick cooling after processing that commercial canners provide cold baths to hasten the cooling of the processed foods.

Deterioration of canned foods may be due to chemical action. This occurs most frequently in foods canned in tin containers. Darkening of corn or the developing of dark deposits in corn or peas may be due to formation of iron sulfide or of copper sulfide. Such discoloration is largely controlled by the use of enamel-lined cans which tend to prevent the formation of these sulfides. Corrosion and perforation of the can, which occurs in some instances, is especially evident with acid fruits, such as

[1] Thermophilic bacteria live and develop at a temperature much higher than that suitable for other bacteria. These bacteria grow best at a range of from 49° to 71° C. (120° to 160° F.).

apples, plums, and berries, but is not unknown with non-acid foods such as pumpkins. Although many conditions affect the rate of corrosion, one of the most important means of controlling it is the removal of the oxygen prior to sealing by effectively exhausting the can.

ACTIVITIES

1. Can fruits by the open-kettle method.
2. Compare the cost and quality of the fruit thus canned with that of the commercially canned.
3. Can fruits, vegetables, and meats by the can-cooked method.
4. Compare time and ease of canning fruits by the can-cooked and the open-kettle methods.

Refer to *Practical Cookery*, "Preservation of Foods," pp. 228–241; Heseltine and Dow, *The Basic Cook Book*, "Home Canning," pp. 598–618; also consult the latest U.S.D.A., Extension, and Experiment Station publications on canning.

PROBLEM 2 *How shall foods be frozen?*

Frozen fruits, meats, poultry and fish once comprised a large portion of the frozen foods available. Then increasing amounts of vegetables were added to the list and more recently prepared and precooked foods. Today about the only foods not available in frozen form are the crisp succulent foods to be served raw, either as relishes or salads. Locker plants, home freezers and freezing compartments in refrigerators have all contributed to the wide use of frozen products. The comparative ease of preparing foods for freezing, the variety of packaging materials available and the high quality of properly handled frozen foods have helped make them popular with the homemaker and her family.

Selecting the container

Almost unbelievable progress has been made in recent years in helping those who freeze food to realize the importance of proper packaging. The number of companies manufacturing containers and materials for packaging frozen foods no doubt exceeds the number manufacturing home freezer storage cabinets. The shapes of the containers and the nature of

the packaging materials are almost as numerous as the companies manufacturing them. Whereas a few years ago waxed paper and cartons and cellophane were the materials most widely used, today we have a variety of materials and combinations of materials that include plastics of various types, plastic impregnated paper, foils alone and laminated on other materials, laminated papers of various types, special coating waxes, metal, and glass. The problem of packaging has become so great that entire periodicals and books are devoted to the subject. Some companies print their papers with different colored inks to facilitate identification of the packaged product; for example, blue for beef, red for pork, and green for lamb.

Almost every container and packaging material has certain points to recommend it. The choice then depends upon availability, cost, nature of food to be frozen, and ease of handling by individual user. Vegetables, for example, which are usually emptied from the container while hard-frozen, should be frozen in a container with no constriction or inset at the top. In the case of fruits that are often thawed in the package in which they are frozen, it is especially important that the container be so fashioned that the syrup will not leak. Visibility of the product may often be desirable but can hardly be called essential. Flexibility and ease of shaping to the product are important considerations in material for wrapping, for it is usually important to exclude as much air as possible. Ease of sealing is also to be considered, whether the sealing is done by means of tape, heat, or stockinette.

That the container is moisture-vapor-proof has come to be an accepted standard, whatever the contents may be. Whether or not the material for wrapping meat shall be treated with an anti-oxidant is a debatable point, and one which continues to receive attention.

Selecting and preparing the food

Selecting fresh food for preservation by freezing presents much the same problem as does selecting it for canning. Only food of high quality should be selected. Fruits and vegetables should not only be free from all signs of spoilage, bruises, and decay, but they should also be at the stage of maturity or ripeness most desirable for eating or cooking.

Not all kinds and varieties of fruits and vegetables are equally desirable for preservation by freezing. Probably the best way to find out about varieties suitable for the locality in question is to write to an Experiment Station located near by. Varieties adapted to one locality and suitable for freezing may not do well in another part of the country.

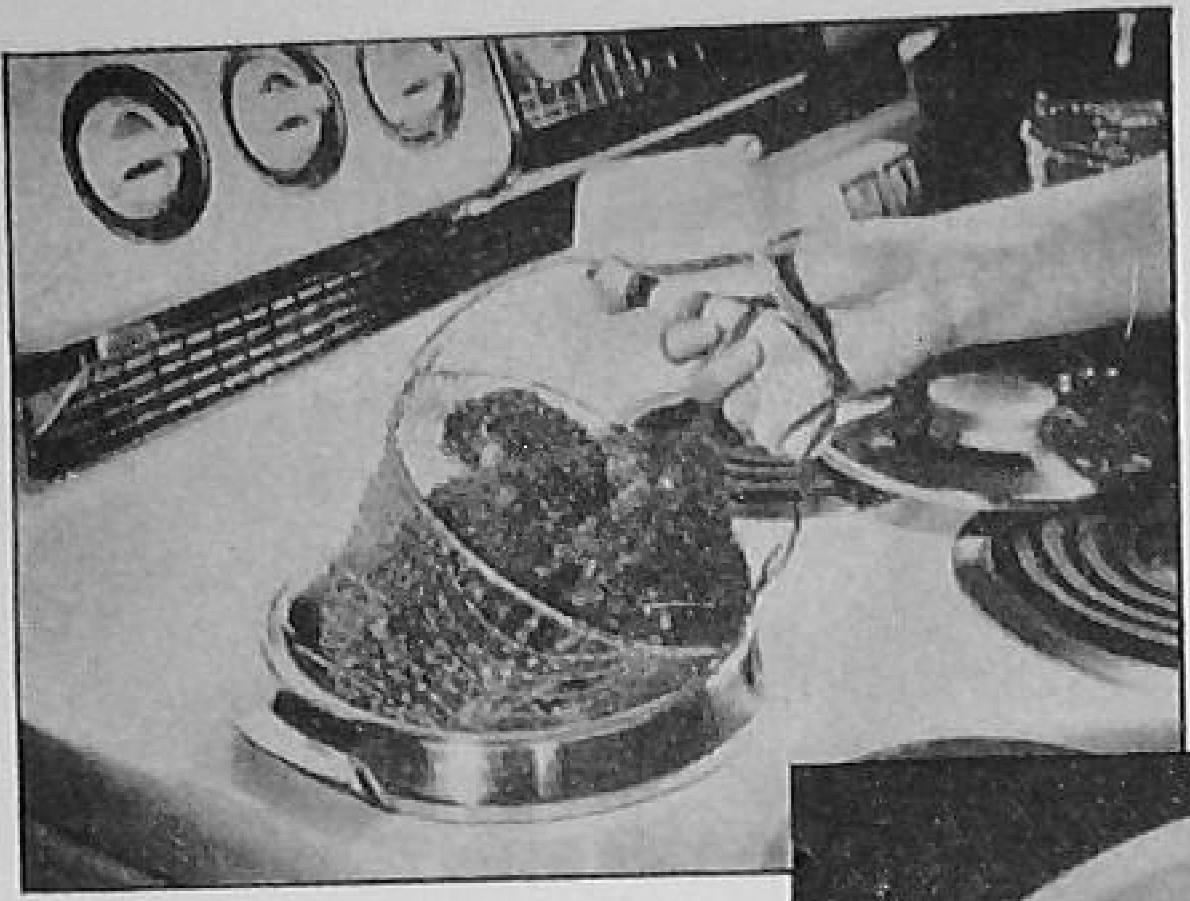
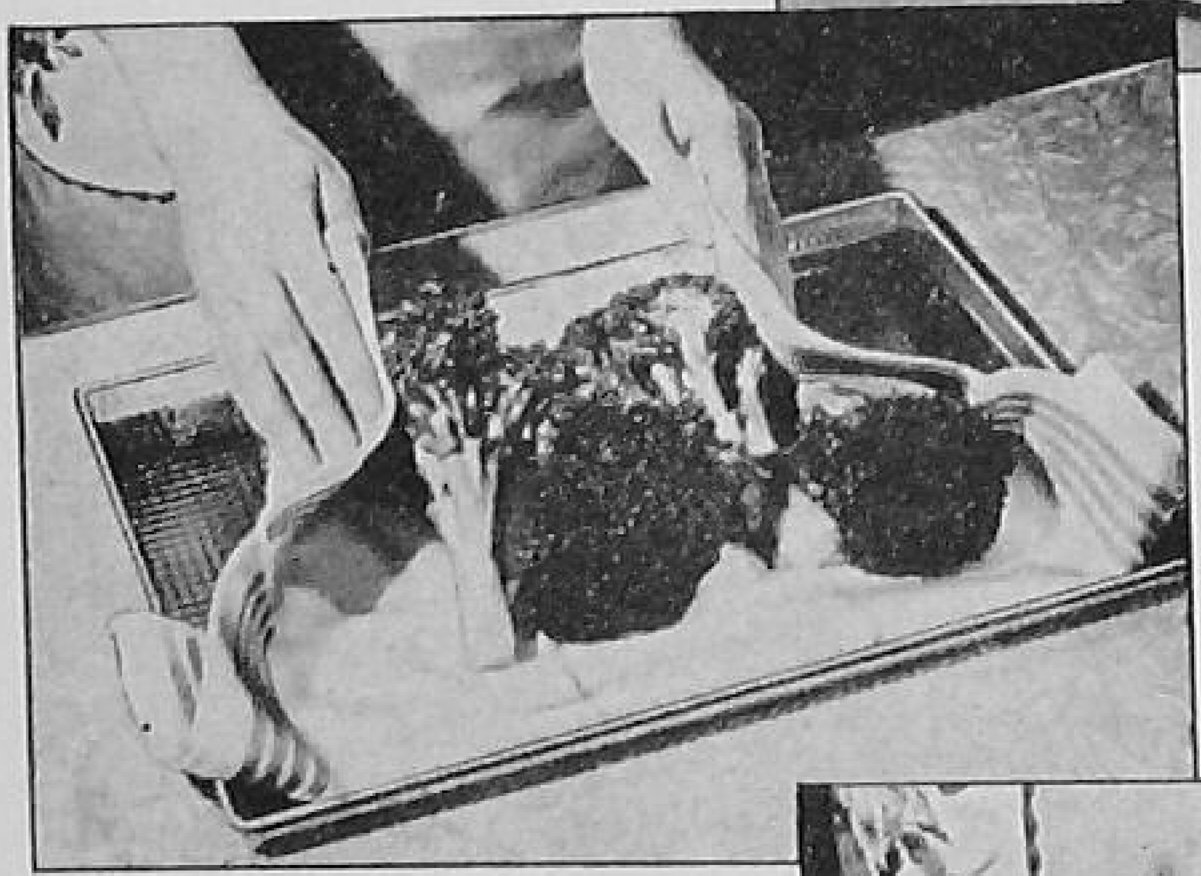


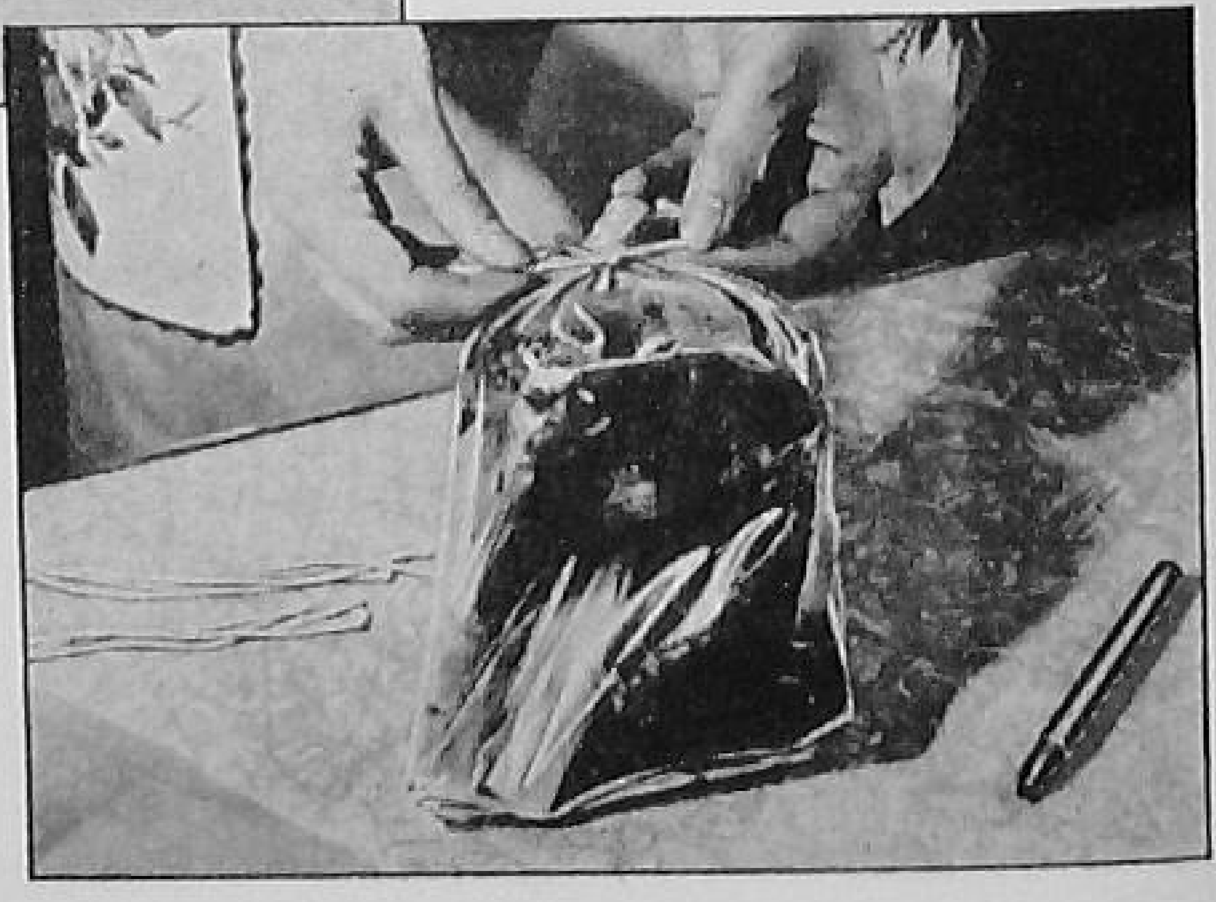
Fig. 129

How to freeze broccoli: Scald not more than one pound of any vegetable at one time.

Cool vegetables quickly by immersing in ice water.



Drain vegetables thoroughly on absorbent toweling.



Package and gently force out any air pockets. Seal securely. Freeze immediately.

Courtesy of Westinghouse

Meat should be of high quality, but it is probably not necessary, and perhaps in some instances not even desirable, to freeze it within a few hours after slaughter. Beef and lamb may be hung in the cooler for a period of a few days or a week to allow desirable enzymatic changes (ripening) to take place. Pork should probably be frozen within two days after slaughter. Poultry is thoroughly chilled, then frozen at once, and fish is best frozen as soon as possible after it is caught.

Fruits and vegetables should be carefully and thoroughly cleaned, and made ready to cook or serve before freezing. Small fruits, such as berries, may be left whole, or they may be crushed or sliced. Fruits such as peaches are peeled and pitted. They may be left in halves, or they may be sliced or crushed. Fruit purées keep well and have a number of uses. Vegetables such as cauliflower and broccoli should be divided into portions suitable for serving; beans should be snipped and may be broken, and asparagus broken into lengths as desired. Vegetables must be scalded before freezing in order to inactivate the enzymes in the plant tissue. This is not necessary for other types of food, although some studies indicate that certain fruits, as apples and blueberries, may keep better if scalded. Scalding must be long enough so that every part of the food is heated to the desired temperature. If this is not done, small amounts of enzymes will be left which will soon cause deterioration of all the food in the container. On the other hand, if heating is too prolonged, the loss of vitamins increases, the fresh flavor is lost, and the quality decreases.

The scalding period recommended for different vegetables varies depending upon the vegetable and the size of pieces. The range in time recommended for individual vegetables in Table 72 is due to the difference in size of pieces. Sufficient water should be used so there is little drop in temperature when the vegetables are added. At least one gallon of water to a pound of vegetables is recommended. Immediately after scalding, the vegetables should be plunged in fresh, cold water and thoroughly chilled.

Meat should be cut into portions of a suitable size for cooking. These may be steaks, roasts, cubes for stews, or other shapes as desired. For economical use of space the bone should be removed from the meat prior to wrapping. The bones may be used for making soup or broth, which may be concentrated and frozen for later use.

Precooked and prepared foods have become important considerations in the use of frozen storage space. As far as the home-prepared foods are concerned, they will probably have the widest use if there is a frozen food storage cabinet in the home. Popular precooked and prepared foods

TABLE 72. RECOMMENDED TIME FOR SCALDING VEGETABLES IN BOILING WATER

Product	Time Required for Scalding
Asparagus.......	2–4 minutes (some of the variation is due to size of stalks)
Lima beans......	2–3 minutes
Snap beans......	2–3 minutes
Broccoli.........	3–4 minutes (some of the variation is due to size of stalks)
Cauliflower......	3–5 minutes (some of the variation is due to size of stalks)
Peas............	1–2 minutes
Spinach.........	1–2 minutes
Corn on cob......	7–11 minutes (some of the variation is due to size of ears) *
Cut corn.........	2 minutes (best to blanch before cutting) †

* Not recommended for general practice as the results are often disappointing and valuable space is wasted.
† U.S.D.A.AIS-48 recommends 5–7 minutes.

include: soups; a limited number of vegetables; certain fruits; meat dishes of various types, preferably covered with a sauce; combination dishes, such as chicken à la king and meat stews; frozen salads; sandwiches; quick breads; yeast breads; cakes of all types; puddings; cookies; and pies. Whether to bake the flour mixtures before freezing or immediately before serving is a point to consider. However, there seems to be a tendency to recommend baking before freezing. Pies are possibly an exception, as many prefer to bake them just before serving. Either method seems to give acceptable results with pies; thus each homemaker may need to experiment in order to determine which best meets her needs.

Packaging the food

The prepared food is next packed into the containers or wrapped, as the case may be. Fruits for freezing may be divided into two classes. In one class are those which may be cleaned and prepared whole and which are not subject to discoloration when exposed to oxygen. These include a greater part of the small fruits, and some as blueberries and cranberries are suitable for dry pack freezing. Most, however, are packed in sugar or syrup. The second group includes fruits which must be pitted or peeled, or both, before freezing. These tend to discolor when exposed to the air. Fruits of this class, excepting cherries, which may be packed in sugar, are usually packed in a syrup. The syrup tends to retard discoloration by covering the fruit and excluding the air. The use of ascorbic acid is effective in retarding color changes of certain fruits, both before freezing

and during the process of thawing. The ascorbic acid may be added with sugar directly to the fruit, but it may be more effective when added with a syrup. The recommended proportion is most often 150 to 200 milligrams of ascorbic acid to a pound of prepared fruit such as peaches, apricots, cherries, and plums, although studies show greater amounts to be desirable for certain fruits. When a syrup is used the ascorbic acid should be added to the cold syrup immediately before pouring over the fruit. In this way unnecessary oxidation of the ascorbic acid is avoided. There are also available various commercial preparations that may be added to the syrup to prevent fruit discoloration. When these are used, directions for the product should be followed. When a syrup is used the sugar concentration may vary from 30 to 60 per cent. However, the most frequently recommended syrups are made of three or four cups of sugar to four cups of water. The fruit is placed in the container and the syrup poured over it. The fruit and syrup are allowed to stand in a cold place long enough for the syrup to penetrate into the fruit. When a syrup is used it tends to dilute the flavor, and the fruit is less desirable for use in pies, jellies, preserves, and sometimes as a dessert because of the added water. For this reason many persons prefer to use sugar even with such fruits as peaches which discolor easily.

As implied above, fruits may be packed dry, with sugar, or with syrup. As a rule, fruits have better texture if sweetened before freezing. Some small fruits may be satisfactorily packed dry and others for special use, as in pies, jellies, jams, and preserves, or for use in special diets, may also be packed dry. They should be kept at a constant low temperature and tightly sealed, for the fruit is easily dehydrated. The chief advantage of this method is that it does not necessitate the freezing and storage of sugar or syrup. It is good for short storage periods. Fruits frozen with sugar may be whole, sliced, or crushed. Freezing with sugar is said to be the oldest and most commonly used method of freezing small fruits. The fruit is packed in sugar, the proportion varying with the fruit and the type of product desired. The proportion frequently recommended is one pound of sugar to four pounds of fruit, although more or less may be used depending upon the sweetness desired. It is well to keep in mind that the higher the sugar content the lower the freezing point. The fruit and sugar should be mixed thoroughly and allowed to stand until all sugar is dissolved and enough syrup is formed to cover the fruit when packed. This will require a longer time for whole fruit than for sliced or crushed.

Vegetables are now packed dry. The use of brine was formerly recommended for vegetables prepared in the home, no doubt because it counter-

acted the effects of high and fluctuating storage temperatures. The brine apparently offers certain protection to frozen vegetables stored under unfavorable conditions. With the improvement in storage conditions, vegetables are now seldom brine-packed. They are much easier to handle both before and after freezing when packed dry.

Allowance must be made for a certain amount of expansion that accompanies the freezing process. In a carton or bag, a head space of one inch is required when packing in syrup or brine. Glass jars or tin cans should have a head space of 1½ inches. Foods packed dry may require a one-half-inch head space or none, depending upon the type of pack.

Freezing and storing

The necessity for prompt freezing of fruits and vegetables cannot be overemphasized. If the delay between harvesting and freezing is prolonged, freshness is impaired, sugars in such vegetables as peas and corn change to starch, vitamins are lost, and bacteria and the other microorganisms multiply. For short periods of unavoidable delay the food should be kept as cold as possible.

Vegetables should be frozen immediately after scalding. If for any reason this is impossible, the food should be kept cold. Fruits when packed with sugar or syrup should be allowed to stand just long enough to allow the sugar to dissolve and the syrup to penetrate the fruit. Even then, the food should be kept cold, that is, just above the freezing point. Meat should be kept cold and, after being cut and packaged, should no doubt be frozen as soon as is expedient.

As with many other points considered, definite recommendations for the best freezing temperature cannot be given. However, rapid freezing of most products is important. The temperature of the freezer may be −20° F. (−29° C.) or even colder. Speed of freezing may be greatly affected by the use of a blast of air or by circulating the air by means of a fan as well as by direct contact with the cold surface. The storage temperature should be 0° F. or below, and it should not fluctuate. Pork shows the effect of too high a storage temperature more quickly than other meats do. Vegetables if improperly blanched or stored at too high a temperature may lose color and develop an "off" flavor and odor. Certain fruits may darken, but the resulting flavor is usually less disagreeable than that developed in meat and vegetables.

Preparing frozen foods for serving

Frozen food which is to be cooked requires no further preparation prior to cooking. Undoubtedly the best practice in cooking frozen vegetables is

to drop the hard frozen vegetables into a very small amount of rapidly boiling water. Experimental work indicates that the color and food value of frozen vegetables are not affected by covering the utensil while cooking, and the thawing and cooking are probably more rapid in a covered utensil. Although the vegetables may be thawed prior to cooking, there is always the possibility that so much time will elapse between thawing and cooking that the vitamin content will be decreased, and even the danger that some spoilage will occur. An exception is corn-on-the-cob; if not thawed prior to cooking, it is either overcooked or is icy in the center. Care should be taken to see that frozen vegetables are not overcooked. The blanching and freezing of the food affects the fiber so that the frozen vegetables cook in much less time than the fresh. As blanching and freezing do not render the food sterile, certain precautions are recommended as regards vegetables. They should always be cooked before being eaten or even tasted. They should always be cooked promptly when taken from storage. The thawed food should never be refrozen and placed in storage again.

Many frozen fruits are served without cooking. They should not be thawed until time to serve them. Fruits such as strawberries and raspberries may even be served while still in the partially frozen or "mushy" stage. Peaches tend to darken rapidly after thawing. Frozen fruits which are to be used in cooked food, such as pies, jams, or preserves, are more easily handled if at least partially thawed.

Meat may or may not be thawed before cooking is begun. This point was considered in some detail in Unit Two. For emphasis it may be stated again that if the food is to be thawed before cooking, little time should elapse between thawing and cooking. Also it is well to keep in mind that the length of the cooking period must be greatly increased when the meat is not thawed before cooking. Considerable research on the cooking of frozen meat indicates that the method of thawing — whether at room temperature, or in the refrigerator, warming oven, or oven — has little effect upon the quality of the cooked meat.

Quantity of frozen produce from fresh food

The yield of frozen fruits and vegetables from the fresh produce is approximately that given for canned foods in Table 71. Meats, poultry, and fish change little in quantity, other than as excess fat and bones are discarded.

Causes of inferior product

Inferior frozen foods may be due to the food selected, to method of

handling prior to packaging, to method of packaging, to rate of freezing, or to temperature of storage. As previously mentioned, certain varieties are much better adapted to preservation by freezing than are others. This seems to be especially true of vegetables but is also true of certain fruits. The quality of the food at the time of freezing is also important. Corn that is too mature, asparagus that is woody, strawberries that are soft and watery, and blackberries that are dry and seedy will not yield a high quality frozen product. Improper blanching of vegetables is another item. It has been shown that peas blanched for too short a time tend to develop a "strawy" odor and flavor and to lose color.

Foods that are held too long before freezing may be inferior in quality due to changes that occur before freezing. The use of packaging materials which do not give proper protection is now recognized as one of the most serious causes of inferior products. Packaging in such a manner that the foods dry and/or are exposed to air results in undesirable changes in almost all types of frozen foods. This is especially evident when either too high or a fluctuating storage temperature is used. Freezing foods too slowly is also likely to give poor results. This is not as likely to occur in a properly operated locker plant as in the home freezer where the addition of a large quantity of unfrozen food may result in some packages remaining unfrozen for many hours. Using too large a package may also cause slow freezing. Fluctuations in storage temperatures are undesirable, especially when the foods are not packed in moisture-vapor-proof containers which effectively prevent loss of moisture. A uniformly high storage temperature may also result in food of inferior quality, especially if it is stored for a considerable period of time.

ACTIVITIES

1. Prepare and freeze typical fruits, vegetables, and meats.
2. Prepare and freeze suitable fruits with and without the addition of ascorbic acid.
3. Use and compare different kinds of packaging materials.
4. Compare the products made with commercially prepared ones of the same kind. Note form, color, firmness or mushiness, and flavor.

Refer to *Practical Cookery*, "Freezing," pp. 241–244; Heseltine and Dow, *The Basic Cook Book*, "Freezing," pp. 645–664; and current U.S.D.A., Extension and Experiment Station Bulletins on frozen foods.

PROBLEM 3 *How shall pickles be made?*

Pickles, aromatic and spicy, stimulate the sense of taste and act as appetizers. Because of their stimulating effect, many types of pickles are frequently called relishes. They have a place in the meal occupied by no other food. To many persons, the term "pickles," if unqualified, means cucumber pickles. These are, however, by no means the only variety. There is a wide range including many vegetables, pickled alone or in combination, and a number of fruits.

"Cucumber pickles," "beet pickles," "peach pickles," or "pear pickles" are, as the name indicates, the pickled vegetable or fruit. If the acid flavor predominates, sour pickles result. If additional sugar is used, "sweet pickles" are obtained. "Mustard pickles" have an outstanding flavor of mustard, "spiced pickles" contain spices, and "dill pickles," dill and sometimes other spices.

Mixed pickles are a mixture of vegetables. Any combination that is desired may be made. Cauliflower, cucumbers, onions, green and red peppers, tomatoes, small ears of corn, tiny melons, and string beans are often used. The vegetables are usually left in fair-sized pieces, although the term "pickle" is sometimes applied to finely chopped mixtures such as chow-chow.

Piccalilli or Indian pickle was made originally in the East Indies. It contains a large variety of finely chopped vegetables and is pungent with spices.

Chutney, a hot, spicy sweet pickle, was first made in India, and from that country still come some of the best grades. Mangoes were the basis of the original chutney. Gradually other foods were added. Today a variety of sweet or acid fruits are used with suitable seasoning, such as ginger, chilies, garlic, mustard seed, and vinegar. Chutney may be served with meats of various kinds but it is considered especially suitable as an accompaniment for curries.

The term "ketchup" or "catsup" is derived from an East Indian name of a pickle. Catsup was originally the spiced juice from salted mushrooms, but now the term is applied to a highly seasoned sauce made of the strained pulp of tomatoes, grapes, green walnuts, or other fruits.

Chili sauce is a sauce made of chilies, tomatoes, and spices cooked in vinegar. It is not strained.

Mango pickle is a popular term for stuffed pickles. These are usually small green melons, burr gherkins, peppers, or cucumbers.

Dill pickles are prepared by fermentation in a dilute brine to which dill has been added. Although vinegar is used in preparing most pickles for the market, it is not used in preparing dill pickles.

Sauerkraut also is prepared by fermentation. The acidity rapidly increases during fermentation until a relatively high acidity has developed.

Effects of ingredients

Pickling is the preserving of food with salt or vinegar or both. Often sugar and spices are added. Each of these substances has specific uses as a pickling agent.

Salt affects the flavor of pickles just as it does that of all other foods to which it is added. When present in sufficient quantity, salt acts as a preservative. Because an organism cannot grow in any solution of a high density, a strong brine retards the development of microorganisms, and may entirely prevent fermentation. In weaker brines salt aids in controlling fermentation. In brine of a certain density lactic acid bacteria develop rapidly, whereas the growth of other organisms tends to be suppressed. The juices and the soluble substances in the food to be pickled are drawn out in a brine by the process of osmosis. The fermentable sugars dissolved in these juices are also extracted. These serve as food for lactic acid bacteria, their utilization resulting in the formation of lactic acid. When the conditions are favorable and there is sufficient sugar present, considerable lactic acid is formed. This may progress to the point where all bacterial action is practically stopped. As the acid acts upon the food, the color, flavor, and texture are changed to produce the pickled state. The drawing out of the liquid from the vegetable by the salt hardens the tissues or makes them firm.

The salt may be added to the food either dry or in the form of a brine. If added dry, juices from the food are drawn out, and the salt dissolves in these to form a brine. The proportion of salt added to the food depends upon the type of preservation desired. A weak brine, two or four ounces of salt in a quart of water, allows rapid fermentation, and the maximum amount of lactic acid may be formed in a comparatively short time. A medium brine, six ounces of salt in a quart of water, checks fermentation and in many instances may be used to store fermented vegetables. A strong brine, eight ounces of salt in a quart of water, prevents fermentation

entirely. Such a brine is used to store vegetables when no fermentation is desired. Freshening, to remove the excess salt, usually precedes their immediate use.

Vinegar affects the flavor of the pickle. It adds an acid flavor which differs somewhat from that due to lactic acid fermentation. It also acts as a preservative. Bacteria are almost if not entirely inactive in acid solution. However, as molds and yeasts develop in rather strong acids, even pickles of a high acidity may mold when exposed to the air.

Sugar acts as a preservative mainly by increasing the density of the pickle solution, thus making the food inaccessible to the organisms. Spices are valuable chiefly because of their volatile oils which add to the flavor and interest of the product. Ground spices may be added, but they impart a dark color to the product. Whole spices may be steeped in the vinegar, or they may be tied in a bag and placed directly in the pickle mixture while cooking. Essential oils of spices, such as cinnamon and cloves, may be added if preferred. Allspice, cinnamon, and cloves show some antiseptic action on yeasts and molds. Other common spices apparently have little if any effect.

Calcium chloride may be added to pickles to make them crisp. Cucumber pickles, watermelon rind pickles, and green tomato pickles are generally more pleasing if they are crisp. The calcium may combine with the cellulose of the food to harden it, or it may combine with the acid and be deposited as calcium salts in the food.

Selecting the method

The choice of the pickling method used is influenced by the product desired. Cucumber pickles may be made by fermentation or by use of a vinegar mixture. The preference for the flavor of one type or another determines the choice. Sweet cucumber pickles may or may not be fermented, but in either case the final treatment is to cover them with vinegar seasoned in some manner. Dill pickles undergo fermentation. Cabbage may be allowed to ferment, in which case sauerkraut is produced, or it may be treated with a vinegar mixture, in which case a pickled cabbage is produced. The fermented pickle may differ in color, flavor, and texture from the pickle prepared with vinegar.

The choice of the method is influenced also by the equipment and storage facilities that are available. Just as in canning, the equipment may be simple or elaborate, as desired. Pickling may actually be done with the equipment ordinarily used in meal preparation, but other equipment is usually desirable. The material is an important consideration in selecting

solution, and the stronger solution should be applied later. Although within limits the pickling solution may be made to suit the taste, for the most part, proportions used in making pickles are carefully worked out and should be followed closely.

ACTIVITIES

1. Prepare vegetable pickles of various kinds.
2. Prepare fruit pickles.
3. Prepare relishes, catsups, and mixed pickles.

Refer to *Practical Cookery*, "Pickles," pp. 249–253; "Relishes, Sauces, and Catsup," pp. 253–255; Heseltine and Dow, *Good Cooking*, "Pickling," pp. 687–696.

PROBLEM 4 *How shall jelly be made?*

Jelly is a fruit product with which all are familiar, yet so many different products are termed "jelly" that a description of good fruit jelly may not be amiss. Goldthwaite gives the following description: "Ideal fruit jelly is a beautifully colored, transparent, palatable product obtained by so treating fruit juice that the resulting mass will quiver, not flow, when removed from its mold; a product with texture so tender that it cuts easily with a spoon, and yet so firm that the angles thus produced retain their shape; a clear product that is neither syrupy, gummy, sticky, nor tough; neither is it brittle and yet it will break, and does this with a distinct, beautiful cleavage which leaves sparkling characteristic faces. This is that delicious, appetizing substance, a good fruit jelly." [1]

Essentials for jelly-making

Good jelly contains pectin, sugar, and acid dissolved in water, each bearing a definite relationship to all of the other ingredients. To obtain such a product requires considerable skill in determining the jellying qualities of the fruit, the proportion of sugar to use, and the degree of cooking necessary. It has been previously shown that fruits contain a number of

[1] N. E. Goldthwaite, *The Principles of Jelly-Making*. University of Illinois Bulletin 31, 1914.

substances including sugar, organic acids, various minerals, cellulose, pectin, and volatile oils responsible for the flavors, some color pigments, and vitamins. Found in the juice are flavoring substances, acids, some minerals, natural fruit sugars, pigments, and pectin. Only the juice is used in jelly-making; so it is the soluble substances of the fruit that determine its jellying power. The presence or absence of pectin is the main factor in determining the suitability of a fruit for jelly-making. An attempt to make fruit jelly without pectin is comparable to an attempt to make a gelatin dessert without gelatin.

Pectin is a carbohydrate-like substance found in fruits. Protopectin is found in under-ripe fruit, and as the fruit ripens pectin is developed from it. If ripening continues, the pectin is changed to pectic acid and alcohol. It is believed that the largest amount of pectin is present in fruit when it is slightly under-ripe. Neither protopectin nor pectic acid has jellying properties; hence it is best to use the fruit when either slightly under-ripe or just ripe. Under-ripe fruits lack the natural fruit flavor of ripe fruits, a point worth consideration.

Not all fruits, even when slightly under-ripe, contain pectin in appreciable amounts. Pectin is precipitated by alcohol, and use is made of this fact in testing fruit juices for pectin. A given amount, about one tablespoon, of the juice is added to an equal amount of alcohol (90 to 95 per cent) and mixed. The amount of precipitate formed is indicative of the amount of pectin present in the juice. When little or no precipitate is formed there is insufficient pectin for making jelly. When a heavy precipitate is formed there is sufficient pectin. If the juice to be used is deficient in pectin, either a commercial or homemade pectin concentrate or another fruit juice which is rich in pectin, such as apple juice, is added.

A fruit juice ideal for jelly-making contains acid. No simple home test for determining the acidity of fruit juice has been worked out. Fruit juice as tart as the juice of sour apples is said to be of the correct acidity, but obviously this standard is indefinite. Juices lacking in acid may have it added in the form of lemon juice or commercial citric or tartaric acid. Fruits which contain sufficient pectin and acid for jelly-making include certain varieties of grapes, crab apples, cranberries, currants, gooseberries, grapefruit, lemons, limes, loganberries, sour apples, sour blackberries, sour guavas, sour oranges, and sour plums. Fruits rich in pectin but lacking in acid include sweet guavas, quinces, and sweet apples. Among those high in acid but low in pectin are apricots, pineapples, rhubarb, sour peaches, and strawberries. Bananas, elderberries, and pears are low in both pectin and acid.

Effects of ingredients

Although many theories exist regarding the physical-chemical structure of jelly, perhaps the most generally accepted theory is that as the jelly is formed, the pectin is precipitated, forming an intricate network within which the syrup is held. The strength of the network depends upon the concentration of the pectin; hence in a dilute solution the network may be so weak that the syrup is not held firmly enough to form a true gel. The presence of acid results in a firmer gel. Acid may toughen the network and thus make the jelly firmer. On the other hand, jellies which are high in acid tend to "weep" or show syneresis. It may be that excess acid has a dehydrating effect upon the pectin, thus causing it to give up some of the liquid or syrup. Sugar probably acts as the precipitating agent, causing the pectin to precipitate and form the network of the jelly. Less sugar is necessary to form a gel or to precipitate the pectin if acid is present. Probably the acid lessens the stability of the pectin, thus making it more readily precipitated by the sugar.

Jelly may be deep red, purple, or pale pink in color, depending upon the color of the fruit. Occasionally artificial coloring is added, but this is seldom done when jelly is made in the home. The flavor varies with the kind of fruit used as well as with the degree of ripeness. The clearness or transparency of the jelly is largely determined by the care taken in extracting and straining the juice, though the ripeness of the fruit is also a factor. Green fruit contains considerable starch, some of which may remain in the juice giving a cloudy appearance. Jellies made from fruit juice are more likely to be clear and sparkling than are artificial jellies made of pectin concentrate, acid, sugar, and flavoring material, because salts, such as are present in fruits, are a valuable aid in obtaining these qualities.

As far as is known, the consistency of the jelly is dependent upon the proportions of pectin, acid, sugar, and water maintained, but certain salts also play an important rôle. A certain proportion gives what is known as a good jelly. Much study has been made in an effort to determine just what effect variation of these proportions has upon the jelly. It has been found that when all other factors remain unchanged, increasing the pectin or the acid[1] increases the stiffness or strength of the jelly, while increasing the sugar decreases it. Each of these findings is true only within certain limits. The flavor and color as well as the strength of the jelly are affected by the method of extracting the pectin. Boiling longer than thirty minutes is undesirable. Boiling pectin in the presence of acid is much more

[1] The hydrogen ion concentration, not the total acidity.

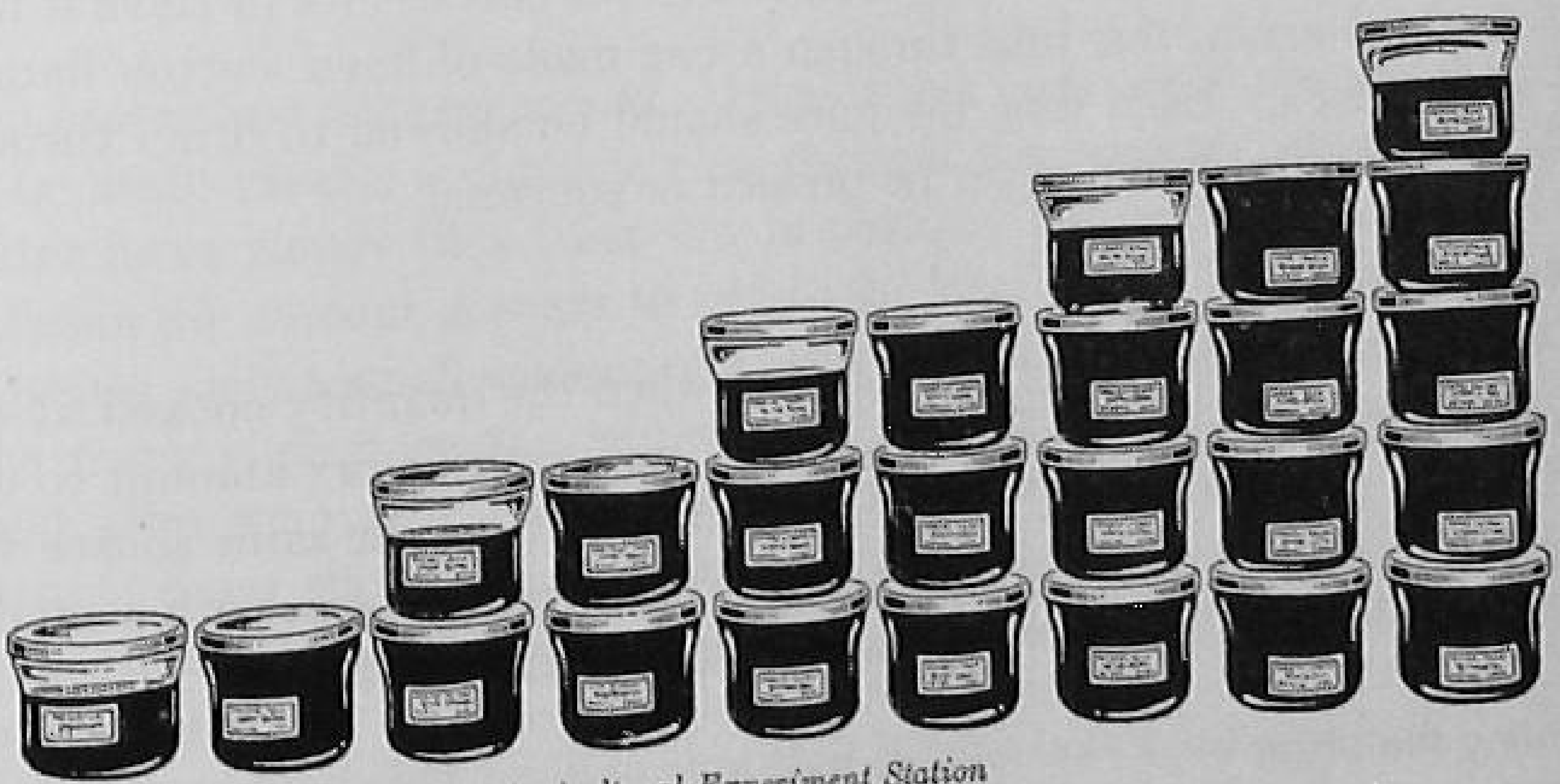
injurious before the sugar is added than afterward. Long boiling is harmful to flavor, strength, and color. Therefore, several short extractions are preferable to one long one.

The percentage of sugar in the finished jelly is practically constant regardless of the amount added within the limits used for jelly-making. Hence, the amount of sugar added, to a large extent, determines the yield of jelly. However, the acidity of the juice definitely affects the amount of sugar that can be safely added. All jellies are practically saturated sugar solutions; consequently the boiling point of the finished product varies only within a limited range, 103° to 105° C. (217° to 221° F.) being the range of accepted temperature.

Extracting the fruit juices

Pectin is found in some raw fruit juices in small quantities and in others not at all, yet juices from these fruits when cooked may contain it in abundance. With all fruits containing pectin, the juice obtained by cooking is richer in pectin than that obtained by cold extraction.

If the fruit to be used for jelly is soft and juicy, only enough water need be added to prevent burning. The fruit may be crushed to aid the extraction of the juice. Raspberries, currants, and similar fruits may be prepared in this manner. The more solid fruits, such as quinces and apples, may well be cut in one-eighth inch slices across the fruit, and from



Courtesy of the West Virginia Agricultural Experiment Station

Fig. 130

Yield and consistency of jelly are largely determined by the proportion of sugar added to the juice. Left to right: sugar increasing from one-fourth cup per cup of juice to two and one-fourth cups per cup of juice.

one half to equal parts of water added. Citrus fruits after being cut in thin slices may have two or three volumes of water added. Fruit low in acid should have acid added before the juice is extracted. The acid is apparently of value in freeing the pectin from the tissues. The time of cooking varies. With soft fruits, such as berries, 2 or 3 minutes of boiling may be adequate. Firm fruits, such as apples and quinces, may yield the best quality juice when cooked 15 to 20 minutes; oranges and other citrus fruits may require from 30 to 60 minutes. In any case, the mass is transferred to a cheesecloth wrung out of hot water, or a fine-meshed sieve, and allowed to drain. This is called Extraction I. A second extraction is often made of fruits rich in pectin, as currants, loganberries, cranberries, and lemons. In this case, fruit is returned to the kettle in which it was previously cooked, is covered with water, and is mixed thoroughly. It is again heated slowly to boiling and again drained. This may result in much or little pectin. If the second extraction is high in pectin, a third extraction may be made in the same way as the second. Usually not more than three extractions are made.

The juice from Extraction I is highest in flavor and pectin, and it is recommended that it be used alone in making jelly. Extractions II and III will yield juices increasingly lower in both flavor and pectin. These may be used separately or combined, depending upon the quantity of the juice and the time available.

After the juice has been drained through the cheesecloth or sieve it may be strained again, this time through a bag made of linen, cotton flannel, or cheesecloth. Each time the juice should be allowed to drain through freely; the pulp should never be pressed or squeezed.

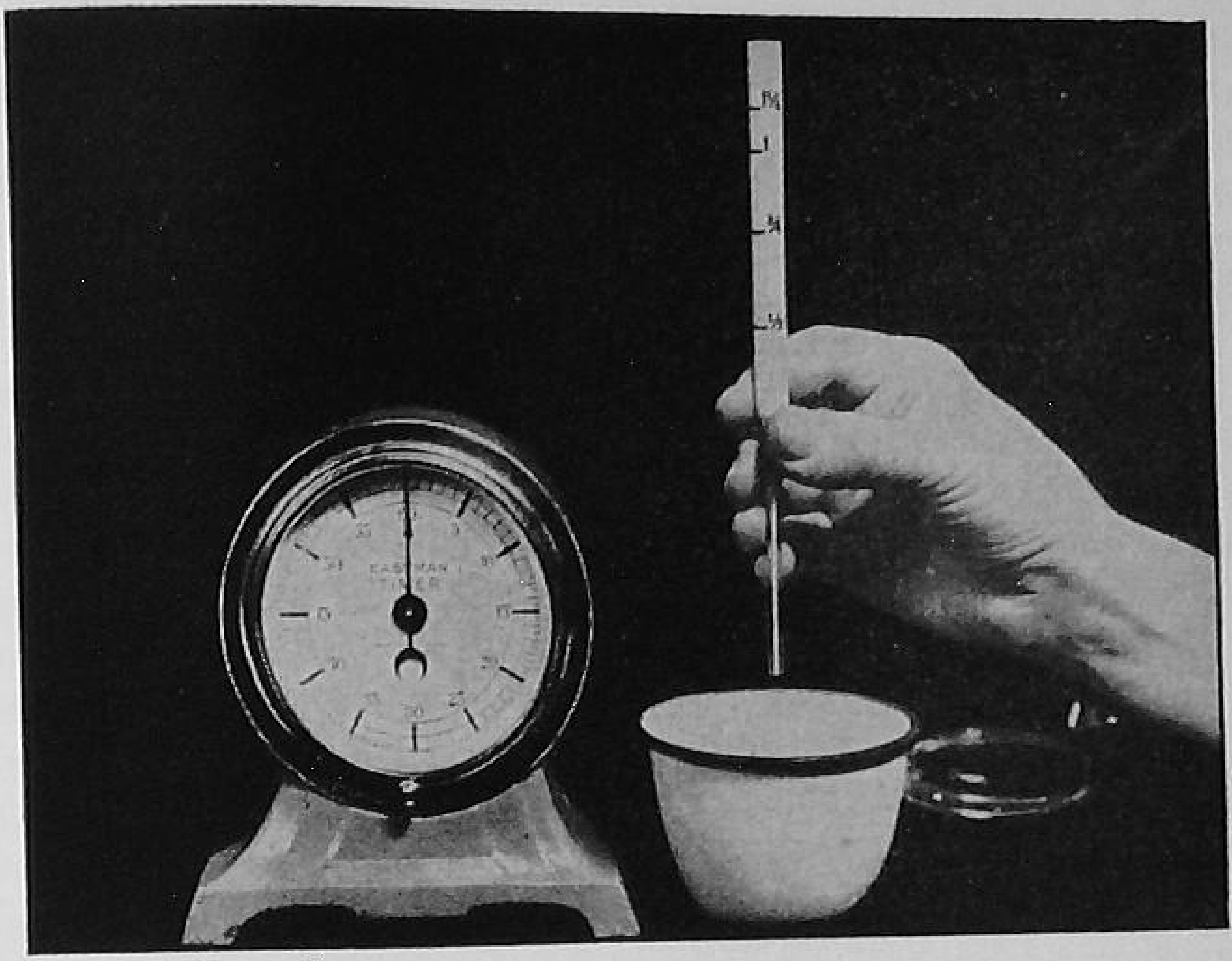
Effect of quantity

As a rule, better results are obtained when the quantity cooked at one time is not too large. One or two quarts are a satisfactory amount to use. However, Carlsson says that "when fruit juice from the same source was used fully as good results were secured with a large recipe as with a smaller one."[1] She does not, however, state the quantity used.

Adding the sugar

The use of the jelmeter, an instrument which measures the viscosity of the extracted juice, is of value in many instances in determining the cor-

[1] Victoria Carlsson, "A Comparative Study of Jellies and Jams Made With and Without an Extracted Pectin," *Teachers College Record*, vol. 28, part II, April, 1927, pp. 784–794.



Courtesy of Jelmeter, Inc.

Fig. 131

The jelmeter aids in determining the amount of sugar desirable for making jelly from a specific juice.

rect proportion of sugar to add. Juice with a high pectin content is found to be more viscous and hence runs through the capillary tube in the jelmeter more slowly than juice low in pectin. The jelmeter is marked to indicate the amount of sugar to add to the juice. That is, if a juice is high in pectin, only a small amount of it runs from the jelmeter in a given time. The mark highest on the jelmeter indicates that if the juice is at that point after running from the jelmeter for one minute, one and one fourth parts of sugar should be added to one part of juice. If the juice has run to the mark designated as one half, then one half as much sugar should be used as juice.

It is suggested that juice so thin that it runs below the one half mark of the jelmeter in one minute is so low in pectin as to require the addition of a pectin concentrate to make good jelly. Applying the alcohol test to the juice to determine the amount of pectin present is also helpful in determining the amount of sugar to be added. Making samples of jelly with different proportions of sugar and juice is another method. Jelly of the

juice from the first extraction, if obtained from a fruit high in pectin and acid, may be made with the sugar and juice in the ratio of ¾:1 or 1:1. The juice from Extractions II and III will require much less sugar. Often the ratio ⅛:1 or ¼:1 is satisfactory. Unless too much sugar is used, the jelly from the later extractions should be of about the same quality as that from the first extraction.

The time of adding the sugar to the juice requires consideration. It may be added at the beginning, midway, or near the end of the cooking period. When sugar is added at the beginning of the cooking period much inversion may occur due to the boiling of the sugar with the fruit acid. Such inversion may affect the texture of the jelly, causing a syrupy consistency. This may be overcome by cooking the jelly in small quantities so that an unduly long cooking period is not required. Some research indicates that boiling the fruit juice after the sugar has been added has much less effect on the pectin than if the juice alone is boiled. For this reason there is a growing tendency to add the sugar at the beginning of the cooking period. When the sugar is added near the end of the cooking period, little inversion of the sugar occurs and the sucrose remains much in its original form; therefore crystallization is more likely to result. Adding the sugar hot is often recommended. Apparently the only value of this practice is the shortening of the cooking period, since the juice is not cooled as it would be by the addition of cold sugar. If the right proportion of sugar has been used, the syrup will jell when cool if cooked to the proper degree. If incorrect proportions are used the syrup will probably not jell at any concentration.

Testing for sufficient cooking

Cooking the syrup just the right amount is important. Many tests are given for determining the exact degree, and each requires some practice. One test, long used, consists in placing a sample on a cold dish and allowing it to cool. With this test there is little danger of undercooking but great danger of overcooking, for while the sample is cooling the cooking continues. When the syrup or jelly leaves a spoon in a sheet, or two drops at a time, the sugar is concentrated enough to form jelly. This is perhaps the most satisfactory test for sufficient cooking; it is known as the sheet or drop test. Some homemakers test by dipping a silver fork into the syrup. When the syrup forms a sheet between the tines it is cooked sufficiently. The appearance of the bubbles as the jelly boils is another fair indication. A few large bubbles which tend to jump out of the kettle, rather than uniformly small ones, indicate relatively higher concentration of the syrup.

The use of a thermometer is also an aid, for the temperature is an indication of the concentration of the sugar. When the syrup boils at 103° to 105° C. (217° to 221° F.), jelly forms if the right proportions have been used.

Selecting, filling, and sealing the containers

Sterilized containers should be used for the jelly. Glasses which are fairly low with a wide base are an excellent choice, as they form attractive molds of jelly which will stand upright when turned out of the glass. The jelly should be poured into the glasses while hot. If it cools to the jellying point before pouring, the jelly is broken up, and the finished product will be uneven. If the jelly is to be kept for any length of time it should be sealed. Paraffin is commonly used for this purpose. If hot when poured on the jelly, it destroys any microorganisms that may have settled on the surface, and effects a seal.

Using pectin concentrates

Extracted pectin or pectin concentrate is frequently added to fruit juices in the making of jelly. This is undoubtedly a desirable practice if juices low in pectin are to be used. The extracted pectin may be a commercial preparation or one made in the home. The pectin concentrate is made by extracting the juice from a substance high in pectin, such as some varieties of apples and the peel of citrus fruits. The resulting liquid is evaporated until quite concentrated. The desirability of home extraction of pectin depends upon the cost of the materials and the value of the homemaker's time. There will probably be variation in the concentration of the pectin content in homemade preparations though satisfactory results are often obtained by their use. A commercial preparation is usually less variable, but its use involves additional expense. However, a comparative study[1] of jellies made with and without commercial extracted pectin showed that, even when the cost of pectin was included, jellies made with extracted pectin cost less per glass than jellies from the same fruits made without the extracted pectin. In most cases, at least twice as much jelly was made from the same quantity of juice when pectin was added.

The use of extracted pectin not only makes it possible to prepare jelly from fruits low in pectin, but also greatly shortens the time required. As the time of boiling is materially lessened, the amount of evaporation is

[1] Victoria Carlsson, "A Comparative Study of Jellies and Jams Made With and Without an Extracted Pectin," *Teachers College Record*, vol. 28, part II, April, 1927, pp. 784–794.

less, and more jelly results. Jelly made with extracted pectin is usually bright in color and transparent, although in a few instances the use of the commercial product seems to fade the color. Added pectin practically insures a jelly which jells, but because the fruit varies in pectin content, sometimes too stiff a jelly is formed.

Rather recently, methods have been developed for making uncooked jellies. The directions for preparing such jellies in the home call for frozen juice concentrates and powdered pectin. The result is a delicate jel with the fresh fruit flavor well retained. However, uncooked jelly has limited keeping qualities due to the fact that it is not sterilized so must be stored in the refrigerator or the freezer.

Carlsson [1] reported that paraffin on certain jellies made with extracted pectin came loose from the edge of the glass but that paraffin on jellies made the same day without extracted pectin did not. Extracted pectin sometimes imparts to the juice a flavor of its own that may be objectionable. It is frequently noticed that jellies made with added pectin lack the natural fruit flavor present in jellies made without this addition. Syneresis or "weeping" occurs in certain of these jellies, whereas it is not noticed in jelly of the same type which does not contain extracted pectin. Pectin concentrates may be obtained in either the syrup or powdered form. In the syrup form, the pectin has limited keeping qualities. Once exposed to the air, it must be used shortly or it will deteriorate. Pectin in the powdered form keeps indefinitely, and the entire package need not be used as soon as opened. There seems to be a growing preference for the powdered form.

Proportions

Definite recipes for the making of jelly are not satisfactory. Even the same kind of fruit varies in pectin content in different sections of the country and in different seasons. Hence the same results cannot be obtained with exactly the same proportions from year to year. The best one can do is to understand the reasons for success or failures in jelly-making and to know the methods which most frequently give good results. "Good jellies cannot be made from all juices by rule o' thumb. Jelly-making as practiced in the home is an art — an art founded on scientific principles. It consists in so controlling results by means of sugar and acid, and by boiling, as to cause the pectin to 'set' in a continuous mass throughout the volume allotted to it." [2]

[1] *Ibid.*

[2] N. E. Goldthwaite, *The Principles of Jelly-Making.* University of Illinois Bulletin 31, 1914.

Causes of difficulties

The greatest cause of failure in jelly-making is the use of too much sugar. An excess causes a soft jelly; a great excess results in a syrup.

Soft jelly may also be the result of insufficient cooking, too much or too little acid, lack of pectin, or prolonged boiling with accompanying hydrolysis of the pectin.

Tough jelly may be due to the use of too little sugar, too much pectin, and overcooking.

Cloudy jelly is usually due to improper extraction. Straining the juice through a coarse cloth or pressing while straining allows some of the pulp to pass through with the juice. Sometimes green fruit gives a cloudy jelly because of the starch present in the juice.

True jelly does not ferment or mold. However, jelly that does not set or jelly that once sets and later liquefies may ferment.

Syneresis or "weeping" of jelly is frequently the result of using a juice too high in acid content. Jellies made with pectin concentrates sometimes weep.

Crystallization in jelly is most frequently the result of too great a concentration of sugar. Usually it occurs in jelly low in acid and often when sugar is added near the end of the cooking period, resulting in little or no inversion taking place. Goldthwaite states that such crystallization is not likely to occur "if the sugar has been originally properly proportioned to the pectin in the juice and if the resulting jelly has been properly sealed up."[1]

Cream of tartar crystals frequently occur in grape jelly. Allowing the juice to stand for twelve to fourteen hours and decanting or straining the cold juice before making the jelly often removes enough of the cream of tartar to prevent the formation of these crystals in the jelly.

Strong flavor and dark color are usually the result of too long a cooking period.

ACTIVITIES

1. Test fruit juice for pectin, using jelmeter and alcohol test.
2. Prepare jelly using natural fruit juice.
3. Prepare jelly using commercial pectin concentrate.
4. Compare the products relative to color, flavor, consistency, and cost.

Refer to *Practical Cookery*, "Jelly," pp. 255–260; Heseltine and Dow, *The Basic Cook Book*, "Jelly," pp. 628–635.

[1] *Op. cit.*

PROBLEM 5 *How shall preserves, marmalades, conserves, jams, and butters be made?*

Preserves, marmalades, conserves, jams, and butters are among the most popular of the food products preserved in the home. Delicious as the commercially manufactured product may be, to many persons it lacks the quality of the "homemade." Because of the high sugar content in most of these products, their keeping qualities are excellent. They are mostly made of acid fruits. When foods low in acid are used, they are usually combined with some acid fruit. Besides contributing flavor to the product, the acid aids in the preservation. Although these products or "spreads," with the exception of certain butters, contain sugar, the amount varies widely.

In making preserves, special attention is given to retaining the original shape of the fruit, which may be cooked either whole or in pieces cut to uniform size. The fruit is preserved in a heavy syrup, but the fruit flavor should not be masked by an excess of sugar. The preserves should be plump, glistening, mellow, and clear.

Marmalades are small pieces or thin slices of fruit suspended throughout a smooth, clear, jelly-like mixture. They are made of pulpy fruits, citrus fruits being the favorites.

"Conserve" has more than one meaning. The term is sometimes applied to products more commonly known as marmalades or jams, but generally to a blend of two or more fruits to which nut meats are added. A conserve of the latter type contains pieces of the fruit which may be in a thick syrup or in a jelly. Conserves are soft and easily spread.

Jams are usually made from small fruits, berries often being used. The entire fruit is cooked with sugar until soft and jelly-like. No attempt is made to preserve the shape of the fruit, and the finished product may be quite smooth and uniform, or it may contain pieces of the fruit.

Butters are less sweet than the other products of this group. They are usually made of large fruits, which are cooked until soft; the pulp is then run through a sieve. The water is evaporated by cooking. Sugar and spices may or may not be added, but a large quantity of sugar is never used. Butters are fine and smooth in texture and because of the low sugar

content mold readily. Fruit pastes are prepared much as fruit butters and then are dried to an almost solid consistency.

Factors affecting the quality

All products are influenced by the quality of the fruit used. Underripe fruit lacks the natural fruit flavor and aroma. It is usually high in acid and low in sugar. Green fruit is firm or even hard and in some cases may be difficult to cook. The degree of ripeness largely determines the fruit quality. This may be hard-ripe or soft or mellow-ripe. The hard-ripe retains its shape best during cooking. The soft or mellow-ripe fruit as a rule possesses the maximum flavor. It may be used advantageously when retention of shape is of no importance. Stale fruit should not be used, for spoilage may result, and the product is sure to be of poor flavor.

The predominating flavor of the product is chiefly determined by the fruit or the combination of fruits. It is also affected by the amount of sugar used. The proportion of sugar used depends upon the product being made and somewhat upon the purpose for which it is intended. For example, fruit butter to be served as a spread or as a sweet would require a higher ratio of sugar than a butter to be served as an accompaniment for meat. For a given product, the ratio of sugar to fruit varies with the type of fruit and its acidity and with the individual taste. The proportions are sometimes varied in adjusting to the increased cost of either sugar or fruit.

The proportion of sugar affects both the quantity and the consistency of these products, just as it does that of jellies. The texture of the fruit in the finished product is largely determined by the time of the addition of the sugar. Fruit cooked in a sugar syrup, or that to which the sugar is added at the beginning of the cooking period, tends to retain its shape, whereas fruit cooked in water breaks up more readily. The sugar syrup draws a portion of the water from the fruit and toughens the tissues of the fruit somewhat. The sugar content largely determines the method of protecting the finished product. Mixtures low in sugar should be sealed in sterilized containers as quickly as possible after cooking is completed. Processing the filled containers for a short time in a hot water bath, or steamer, is usually desirable. Products high in sugar require only a coating of paraffin.

Cooking makes the fruit tender, changes the flavor, and sometimes the color. It also breaks down the fibrous structure more or less, dissolves the pectin, and facilitates the absorption of the sugar by the fruit. It causes a reduction in the volume by evaporation of moisture. Cooking for too long a time causes a darkening of the color and tends to develop a

caramel flavor, especially if much of the cooking occurs after the sugar is added. Prolonged cooking also breaks the pectin down to pectic acid and destroys its jellying power, thus affecting the consistency of the product.

The equipment available for use may affect the character of the finished product. Too small a kettle may necessitate a slower rate of cooking and hence retard the rate of concentration, resulting in a darker color and a strong flavor. Metal kettles and metal spoons may cause a darkening of the product. The type of material of which the cooking utensil is made and the character of the heat used determine the ease with which the product scorches.

The judgment and skill of the worker influence the quality of the finished product. To make a superior product, the worker needs to know the time to add the sugar, the intensity of heat desirable, and the degree of cooking which is satisfactory. Tests are given for sufficient cooking of each product, but even then experience is necessary for their effective application.

Preserves

A general rule for making preserves is to allow three fourths of a pound of sugar to each pound of fruit, but there are many exceptions to this, as the ratio depends upon the acidity of the fruit. Hard fruits, such as quinces, should be cooked in water until tender. The aim in making preserves is to introduce the syrup into the fruit. The syrup is of a different density than the liquid in the fruit. This difference tends to be equalized as the fruit is cooked in the syrup. If the syrup is of medium density, it enters the fruit only a little more slowly than the juice is drawn out. Then the fruit, although somewhat shrunken and flabby, does not become tough. If the syrup is heavy, the juice is drawn out far more rapidly than the syrup enters, and the preserves shrink excessively. Recipes for preserves of various fruits generally indicate the type of syrup to use or the ratio of water to sugar desirable for a particular fruit.

Fruit for preserves should be cooked as rapidly as possible. When the fruit is tender, clear, bright, and of a good color, it should be removed from the fire. Preserves may be canned immediately, but it is generally considered better to allow the fruit to remain weighted down in the syrup in the kettle overnight. This allows for greater exchange of liquids, the fruit becomes plumper and higher in sugar content, and the syrup becomes thinner. After standing overnight the fruit may be packed into the containers and the syrup concentrated to the desired density, then poured over the fruit in the containers. This method insures a rich, sweet product

without the danger of scorching and overcooking which may result from a one-period cooking.

To prevent molding, the preserves may be processed after packing in the container. A simmering temperature, 82° C. (180° F.), is best for delicate products. This temperature is sufficient to destroy molds, and it least affects the quality of the preserve. Twenty minutes at 82° C. (180° F.) is sufficient for pint jars of preserves. Three or four minutes at 100° C. (212° F.) is an acceptable alternative, if preferred.

Some preserves, such as those made from strawberries and cherries, do not necessarily have to be boiled, but the fruit may be covered with a hot syrup and allowed to absorb the syrup in a slow heat such as that from the oven or the sun.

Marmalade

Marmalades sometimes contain equal parts of sugar and fruit, but frequently the proportion of sugar exceeds that of the fruit. Citrus fruits are most often used for marmalades. Pectin, essential to produce a jelly-like consistency, is present in the skin of these fruits. A greater volume of marmalade is obtained when as much of the pectin as possible is extracted. This is accomplished by allowing the thinly sliced fruit to stand in water for a day, heating it, and then allowing it to stand for another day. The greater the surface of peel exposed, the more readily the pectin is brought into solution. After the pectin is in solution, part of the water should be evaporated, the sugar added, and the cooking completed in a short time. Marmalade is cooked sufficiently when the jellying point is reached, as determined by any one of the tests previously given. If the marmalade is occasionally stirred while cooling, the fruit will be better distributed throughout. It is then packed in sterilized jars and sealed at once. Paraffin may be used for this purpose.

Conserves

Conserves contain, as a rule, from one half to three quarters of a pound of sugar to each pound of fruit. Any combination of fruits desired may be used. Many conserves contain raisins and most of them nuts. If conserves are made of hard fruits or vegetables, these ingredients are cooked before the sugar is added. Soft fruits may have the sugar added at the beginning of the cooking period. Conserves should be cooked rapidly. The nuts should be dipped in boiling water a few seconds before they are added to the fruit. They should be added not more than five minutes before the cooking is completed because long cooking destroys their flavor. When

done, conserves are thick and may give a jelly test. They are packed in sterilized jars and may or may not be processed, depending upon the proportion of sugar used.

Jams

Jams contain from three quarters to 1¼ pounds of sugar to each pound of fruit. The fruit is cooked until tender and the water is well evaporated before the sugar is added. Then, bringing the mixture to a full boil is often the only cooking necessary. Care should be taken to see that the fruit is not too concentrated before the sugar is added; otherwise a jelly may form before the sugar is thoroughly mixed with the fruit. This will be broken by the stirring, and an even jelly will not form again. If the sugar is not thoroughly dissolved, crystals may form as the mixture stands. Jams, when sufficiently cooked, give a test similar to that for jelly, and they "heap up" on the spoon. Many jams are believed to have a better flavor if allowed to cool slightly before being poured into the jars. Jams do not require processing, and covering with paraffin effects a satisfactory seal. The paraffin should be applied as soon as the jars are filled in order to prevent molds from settling on the surface. It is good practice, however, to seal jams in glass containers.

Uncooked jams made from frozen or fresh fruits, a pectin concentrate and sugar are delicate in flavor and texture. They retain the fresh fruit characteristics well but must be stored at low temperatures if they are to be kept for any length of time. The ease of making as well as the quality of the product has led to rather wide use of these uncooked products.

Butters

Fruit butters may contain either no sugar or as much as one half pound of sugar to one pound of fruit pulp. The decayed portions are removed and the washed fruit is cooked in water or steamed until tender. The cooked fruit is pressed through a sieve or colander, and the cores, peelings, and other similar substances are removed. The sieved pulp should be evaporated as much as possible before the sugar is added. After it is added the cooking should be completed rapidly with constant stirring. Spices, if used, should be added after the fruit pulp is concentrated, as they lose their volatile oils and their fragrance with long cooking. The butter is cooked sufficiently when it is thick and more or less transparent. It will heap up on the spoon and will drop from the spoon in sheets. Butters should be packed in sterilized containers and processed for three or four minutes at 100° C. (212° F.).

Causes of difficulties

Shriveled preserves may result from starting the cooking in too heavy a syrup. The cooking should be started with a thin or medium syrup.

Preserves which break up badly may have been cooked in too thin a syrup, or they may have been made from overripe fruit. Stirring during the cooking period and overcooking also break up the fruit.

A hard or tough preserve sometimes results from the use of an unusually hard fruit, such as quinces and some varieties of apples and pears. If such a fruit is started to cook in a heavy syrup, it never becomes tender. To prevent such hardness the fruit should be partially cooked in clear water and then added to the syrup. Sometimes starting the cooking in a thin syrup is sufficient.

A dark color in any of these products may be the result of too-long cooking. This often occurs when too large a quantity is cooked at one time.

A strong flavor also results from cooking for too long a time. This usually occurs when the sugar has been added at the beginning of the process.

Fermentation of the finished product usually indicates too low a concentration of sugar. This often results from insufficient evaporation, due to too short a cooking period.

Mold may occur on the products that contain a small proportion of sugar if they are not sealed immediately after being cooked. Conserves frequently mold when the nuts have not been sterilized.

Crystallization of sugar in marmalades and in jams usually results from too high a proportion of that ingredient, either because incorrect amounts of sugar have been used or because the product has been overcooked. Occasionally adding sugar too late in the cooking process causes crystallization.

ACTIVITIES

1. Prepare preserves, marmalades, conserves, jams, and butters, making use of available fruits in season; of canned fruits; of dried fruits.
2. Compare costs of products made in class from these different sources with each other and with those of commercially made products of similar quality.

Refer to *Practical Cookery*, "Preserves, Jams, Fruit Butters, Fruit Pastes, Marmalades, and Conserves," pp. 244–249; Heseltine and Dow, *The Basic Cook Book*, pp. 619–635.

PROBLEM 6 *How shall foods be dried?*

Homemakers having limited equipment find the drying of foods an especially desirable means of preservation. Unlike canning, this process involves no large kettles for cooking or processing the food, and no special containers for sealing the food. Nor do dried foods require the addition of sugar, salt, or other preservatives as do pickles, jellies, jams, and preserves. Only a small amount of storage space is needed for dried foods, because their bulk is but from one ninth to one fourth as great as that of the fresh foods.

Foods from which the water has been removed to such an extent that the development of spoilage agents is checked are variously spoken of as "dried," "dehydrated," and "evaporated." In popular usage no real distinction is made in the use of these terms. The term "dried" is applied to foods from which a large proportion of the moisture has been removed regardless of tbe method. The two popular methods are by "sun-drying" and by "dehydration." Dehydration is drying by artificially heated air with carefully controlled conditions of temperature, humidity, and airflow. Evaporation usually refers to drying by artificially heated air but under less carefully controlled conditions. Many persons note little or no difference in the foods dried by the different methods. However, Cruess [1] gives the following advantages for the dehydration of fruit: (1) cooked dehydrated fruits more nearly resemble cooked fresh fruit in flavor and color than do cooked sun-dried fruits, (2) the production of dehydrated fruits is usually accomplished under more sanitary conditions than that of sun-dried, (3) more careful control of the finished product is possible with dehydrated fruits, (4) the use of dehydrators prevents loss due to rain damage, (5) the yield of the dried product by dehydration is greater than by sun-drying, (6) less space and fewer trays are required for dehydration than for sun-drying, and (7) dehydrated fruits are commonly superior to the sun-dried for cooking purposes.

The pioneer homemakers dried many foods. Bags of dried corn and peaches, gay festoons of dried peppers, and long strings of dark, leathery

[1] W. V. Cruess, *Commercial Fruit and Vegetable Products*, p. 463.

dried apples were a common sight in the attics of homes of half a century ago. Today a wide variety of foods are dried, but only a few are important. The homemaker usually finds that dried berries require too much time for preparation; so she prefers canned ones. Ordinary plums have a thick, tough skin that prevents evaporation; thus fermentation often occurs during attempted drying. Spinach, tomatoes, and many other vegetables are so juicy that they are seldom dried in the home.

Commercially, grapes are the leading dried fruit, though quantities of prunes, peaches, and apricots are also dried. Dates and figs are likewise extensively preserved in this way. All fruits that are to be dried should be fresh and ripe. Those with distinct flavors are generally preferred. Any basis for the selection of fruits for drying is largely physical. Fruits that are seldom if ever dried have the same water content and in some cases about the same sugar content as those commonly selected for drying. As a rule fruits which dry satisfactorily have a firm texture. Those that are dried whole should have thin skins which permit free evaporation of the moisture.

Immature vegetables, such as string beans, cauliflower, and spinach, deteriorate rapidly during drying. Root vegetables, onions, and cabbage as a rule keep well in common storage; hence drying is not recommended. Mature vegetables, such as corn, peas, and beans, are favorite vegetables for drying. A high-quality dried product requires a fresh, tender, clean vegetable in prime condition. The drying of vegetables is less understood than that of fruits, and more difficulty is usually encountered with them. However, work in recent years has indicated the necessity of precooking vegetables that are to be dried. This precooking varies from 30 to 60 minutes for beets to 5 to 8 minutes for okra, with no heating recommended for mushrooms. No way has yet been found to prevent deterioration after drying, although precooking which destroys all enzymes definitely retards deterioration. Immature vegetables, if dried, may be kept satisfactorily for a period not exceeding three months.

The protein, carbohydrates, and minerals in dried foods remain practically unchanged, but the effect of drying on vitamins has long been questioned. Though more work may need to be done before definite conclusions are reached, research indicates that dried, sulfur-dioxide-treated fruits suffer only a small loss, if any, of ascorbic acid, whereas untreated dried fruits are almost entirely lacking in this nutrient. However, it is probable that when the treated fruits are cooked for serving this vitamin will be largely destroyed. Other vitamins, which are much more stable than ascorbic acid, are probably little affected.

Selecting the equipment

If a limited amount of drying is to be done, little or no equipment in addition to that found in every kitchen is needed. A number of trays upon which the fruit may be spread out in thin layers are desirable. These may be purchased or they may be made at home. Coarse curtain netting is a suitable covering for the trays, or cheesecloth may be used. If the weather conditions favor sun-drying, the fruit may be placed on racks of some kind which hold it above the ground, or it may be placed on gently sloping roofs with a south exposure. Flat tin roofs are also good. If the weather conditions prohibit sun-drying, and drying must still be undertaken, some provision for inside drying is necessary. Oven-drying is a home drying method sometimes used. A simple drier for use on the stove may be obtained. In addition, various types of cabinet dehydrators for home use have been developed.[1] Directions for building either a home or a community drier are available from the United States Department of Agriculture or from many of the State Experiment Stations.

Selecting the food

Drying does not improve the quality of the food. Perhaps because greater changes occur in drying foods than in other methods of preservation, greater care is necessary in selecting the food. Because the temperature at which food is dried is near the optimum for the development of spoilage agents, any badly contaminated food is likely to spoil before sufficient moisture is removed to insure keeping.

Drying

As a rule, the quality of a food is best maintained by rapid drying. Any condition favorable to the evaporation of moisture tends to hasten the drying of the food. As the air in direct contact with the food soon becomes saturated and evaporation tends to stop, circulation of air is important. Circulation may be provided by natural breezes, or the movement of air caused by warmer currents passing into cooler ones, or to artificial methods such as the use of the electric fan.

Air at higher temperatures absorbs more moisture than does that at lower. Air may be heated either by the sun or by artificial methods. The best temperatures for drying foods are between 43° and 66° C. (110° and 150° F.), exact temperature depending on the nature of the food. Under no conditions should it go above 66° C. (150° F.). This usually necessitates

[1] G. A. Shrey, *Dehydration of Fruits and Vegetables in the Home.* Bulletin 183, The University of Tennessee Agricultural Experiment Station.

careful watching; for as the food begins to dry, the temperature tends to rise. Although air of a temperature above the optimum will hold more moisture, its use is not desirable because of the effect upon the food. As the temperature of the air approaches the boiling point of water, the fluids in the food expand, break the cell walls of the food, and escape. With these are lost some of the soluble substances and some of the flavor of the food. The sugar may be caramelized, or the food may develop a scorched flavor. Higher temperatures may also actually hinder evaporation by forming a hard, dry layer on the surface of the food and thus preventing the circulation of water from the interior to the surface. The humidity of the air also affects the rate of drying, as air saturated with moisture has no drying value, whereas dry air absorbs moisture rapidly.

Preparing the food

Food to be dried, excepting meat, is washed carefully, may be peeled if necessary, and, if in a large unit, is frequently sliced. Apples, carrots, sometimes meat, and foods of a similar nature are sliced. Fruits to be dried whole, such as prunes and figs, which have a waxy covering over the surface, are dipped in lye solution to remove the wax, to check or crack the skin, and thus hasten evaporation. Darkening of fruits while drying is due to oxidation. This is not undesirable in prunes, currants, and most raisins, but it is considered undesirable in the lighter colored fruits. Sulfur fumes prevent this oxidation and also act as a preservative. These are formed from burning sulfur and consist of sulfur dioxide. The effect on health of foods treated with this chemical has been questioned. It is generally believed that the amount present on the fruit is too small to be injurious, and much of that which is present is removed if the fruit is washed carefully before being used. Vegetables prepared for drying are precooked, preferably by steaming, although they may be cooked in boiling water. Precooking stops enzyme action, checks ripening, and prevents changes after drying. Best results may be obtained with vegetables by steaming quickly at a high temperature such as is obtained in the pressure saucepan. When ready for drying, foods should be spread in a thin layer. In this way a greater surface is exposed to the air, and drying takes place more rapidly.

Testing for sufficient drying

Various lengths of time are required for complete drying, depending upon the food and upon the method used. Some vegetables may require only two or three hours, while certain fruits may require several days.

There are several tests for determining the right degree of dryness.[1] A handful of the food pressed together springs apart when released. A cross section, freshly cut, shows no free moisture and when pressed does not exude water. Dried fruit feels soft and velvety and is somewhat leathery. Vegetables may be crisp and crackly.

Conditioning

Even if the food has all been dried on the same tray it may not be uniformly dry. Some pieces may be quite moist when the others are "hard dry." Such unevenness is overcome by piling the food in a heap for one or two days or longer. It should be stirred occasionally to aid in the uniform distribution of moisture.

Storing

The storing of dried foods is important. Foods exposed to insects while drying should be heated to about 71° to 82° C. (160° to 180° F.) before storing. This is called processing. Special containers or special temperatures are not required for proper storage, although protection from dust, insects, and rodents is necessary, and a low temperature favors long keeping. Exposure to moisture must also be prevented; hence storage in a dry place such as a dry, airy room or attic is satisfactory. Dried foods may be stored in any of the containers developed for packaging frozen foods, in paper bags securely tied, in cans with fairly tight-fitting lids, in heavy pasteboard boxes, or in wooden boxes lined with several layers of paraffin-coated paper.

Causes of difficulties

Fermentation or souring may be due to the selection of the wrong type of fruit for drying, or it may be the result of slow drying due to the high humidity of the surrounding air. It may result from too high a temperature at the beginning of the drying period which causes a tough layer to form on the surface, or from too low a temperature throughout the period which delays drying.

A hard, crisp product results from too long a drying period.

Infestation with insects indicates exposure to them either during drying or after storing.

Molding, fermentation, or souring during storage may be attributed to insufficient drying, or to faulty storage in an airtight container in which, as the temperature rises and falls, the moisture is alternately vaporized

[1] *Oven Drying.* United States Department of Agriculture, AWI 59.

and condensed, thus producing conditions suitable for the growth of spoilage agents.

Darkening of foods during drying is due to enzyme action. Unless the food is treated with sulfur dioxide this will occur in many foods. Darkening of light foods or fading of the bright colored foods after drying results from exposure to bright light.

ACTIVITIES

1. Dry celery leaves, sage, mint leaves, parsley, and similar seasoning materials.
2. Dry apples or other suitable fruit.
3. Dry corn, peas, or lima beans.
4. Compare these products with similar items available on the market.

PROBLEM 7 *How shall meat be preserved?*

The daily use of meat and the irregularity of its production, together with its tendency to spoil, have made necessary some means for its preservation. Though the preservation of meat has developed commercially into one of the largest industries of the world, it yet remains an important activity in many homes. The reason for the continuance of this activity in the home is twofold. First, and especially when meat is home-produced, it is an economical practice which both assures availability over a longer period of time, and prevents loss. Second, home-cured meats are considered by some to be superior in quality, particularly flavor, and so are regarded as choice treats.

Drying

Primitive man used drying as a means of preserving meat. The Indians of North America cut buffalo or other meats in strips and hung them to dry. The result was a product with low water content, good keeping qualities, and a texture quite different from that of fresh meat. In some sections of the Southwest a limited quantity of this type of meat, known as "jerked meat," is still found. Dried beef, a product common on the market, resembles "jerked beef" somewhat, although it is prepared by

other processes. Most of the dried beef used today is treated first with a brine, then drained, dried, and finally smoked. Meat thus treated, if thoroughly dried and smoked, keeps for long periods. The process, however, toughens the fibers of the meat, and often detracts from its appearance, two factors which tend to limit the use of dried meats. Today little meat other than beef is dried.

Curing

Curing of meat by the use of salt and other chemicals has undoubtedly been the most popular method of preserving meat in the home. However, this method is rapidly giving way to freezing, at least in many sections of this country. Salt alone acts as a preservative, discouraging or even inhibiting the growth of bacteria, but the addition of sugar or molasses, saltpeter, and sometimes pepper is desirable. The salt tends to make the tissues dry and hard, and the sugar tends to counteract this effect and also to soften the harshness of the salt, thus improving the flavor. Saltpeter acts as a preservative, hastens the curing of the meat, and preserves a red color. Pepper affects the flavor and may have some preservative action. These preservatives may be added either dry or in a brine. In cold climates brine-curing is satisfactory. In warmer climates where the temperature rises above 10° C. (50° F.) this method is not recommended. Warm temperatures delay the curing of the meat by this method, and spoilage may occur. In suitable climates brine-curing is desirable for homes not well equipped for dry-curing as it offers greater protection from rodents and insects. It is also less trouble than dry-salting, which requires rubbing the salt into the meat three or four times, whereas the brine-curing requires only the pouring on of the brine. However, the brine must be watched to see that it does not become "ropy," an indication of incipient spoilage. Should this condition occur, it becomes necessary to remove and boil the brine.

Smoking

Smoking is a supplementary treatment often given after brining or dry-salting meat. It materially affects the flavor and is also an aid in preservation. The creosote of the smoke is probably the main preservative. The discovery of the value of smoking meat dates, no doubt, from the time when open fires in crude fireplaces were common in dwellings. The meat hanging near the fire was smoked and partially dried; the flavor changed; and the keeping quality improved. Smoking is most satisfactorily accomplished by burning green hickory or maple wood. Corn cobs are some-

times used, but in such case the meat darkens, giving an unattractive dirty appearance. There is on the market a chemical compound, sometimes called "liquid smoke," that may be applied to the meat as a substitute for the smoking process. Also available is a salt which has been chemically treated so that, when it is used, it both preserves the meat and develops a flavor simulating that gained in the process of smoking. As a rule, any chemical treatment is considered inferior to the actual smoking. However, such treatment is regarded as satisfactory and has the advantage of consuming little time and requiring no special equipment.

Freezing

Freezing is rapidly replacing all other methods of preservation for meat. In many communities freezer locker space is devoted almost entirely to frozen meats, but in others the space is occupied in part by fruits and vegetables. As is true for all foods preserved by freezing, meat should be carefully wrapped in moisture-vapor-proof material. It should be frozen quickly and should be stored at a constant temperature of 0° F. or lower. A storage period of from six to twelve months is usually practical. Pork fat becomes rancid much more readily than the fat of beef and lamb; hence pork should be stored for a shorter period of time. However, from the standpoint of efficient use of freezer storage space, no food should be stored for long periods. Frozen meat closely resembles fresh meat, and methods of cookery are the same.

Canning

Canning meat is a common practice. Only the can-cooked method using a pressure cooker is used. A temperature of 116° C. (240° F.) as obtained with ten pounds pressure is recommended.

Selecting the method

The method of preservation to be used depends upon the kind of meat. Pork, the meat most commonly preserved in the home, may be treated in a variety of ways. Every method which is commonly practiced, with the possible exception of drying, is applicable to pork. It may be cured, smoked, frozen, or canned, or it may be partially cooked and covered with hot fat. Beef is more frequently frozen or canned in the home, although it may be dried or corned or partially cooked and covered with hot fat. Lamb, for the most part, is used fresh or frozen, although it may be corned or cured by the use of salt. Poultry is usually frozen or canned. Fish is frozen, canned, dried, or cured. All kinds of meats are extensively pre-

served by cold storage where such facilities are available. This method of preservation is of great importance, commercially, but its use in the home is limited. Meat that is to be preserved by home methods for a long period of time, may best be frozen or canned; the meat so processed then closely resembles the fresh meat. A highly seasoned palatable product results from the curing and smoking of meat. Because these cured products are so distinctive and different in flavor, they may become tiresome if used day after day; but they have an important place as a means of adding variety.

Equipment often limits the methods that can be employed for preserving meats. Brining requires an earthenware crock or jar or a clean hardwood barrel large enough to hold the meat and sufficient brine to cover it thoroughly. For dry-salting meat a large container is necessary; it need not be watertight. Curing can be satisfactorily practiced only when a cool, dry cellar or room is available for storage. Drying of meat is practical in the home only in dry climates. Freezing may be successfully practiced when facilities are available for quick freezing and then for storage at 0° F. either in a commercial locker plant or in a home freezer storage cabinet. As the canning of meat requires a temperature considerably above the boiling point of water, this method is advisable only when a pressure cooker is available. Of all the methods employed for preserving meat, that of partial cooking and covering with hot fat is probably the only one which can be used successfully without special equipment.

For home use the period for which meat is preserved is usually not greater than from winter to the following autumn. Often a shorter period is sufficient. For the longer storage periods, curing, freezing, canning, and drying are all suitable methods to use; during the winter in cold climates, the meat may be hung and preserved by the cold, or it may be frozen and packed in snow for a comparatively short period. Keeping in the refrigerator should not be attempted for even two days unless a temperature of 7° C. (45° F.) or less is maintained. Regardless of the method to be used, the meat should first be thoroughly chilled.

Causes of difficulties

Because meat is so susceptible to the action of bacteria, spoilage of preserved meats frequently occurs. Perhaps the most trouble is experienced with cured meat, despite the fact that the correct proportions of ingredients to be used have been determined. The difficulty is often due to the failure of the meat to absorb the brine or the dry-cure because of incorrect temperatures. A temperature so low that the meat is frozen

practically stops the curing. Too high a temperature 10° C. (50° F.) or above interferes with absorption of the chemicals, especially in brine-curing, and permits bacterial action to take place. The brine may become "ropy" during the curing process, in which case there is danger that the meat will spoil. Removal of the meat from the curing medium before the curing is complete may also result in spoilage. If flies and other insects come in contact with the meat, spoilage usually occurs. Storage in too damp a place may cause the meat to mold. Frozen meat may become rancid due to improper handling before freezing, to incorrect packaging, or to too high a storage temperature. Drying or "freezer burn" also results from improper packaging, and this condition may be accelerated by fluctuating storage temperatures. Partially cooked meat may spoil because it is insufficiently cooked or is not entirely covered by lard. Canned meat spoils for the same reasons that other can-cooked foods do, mainly under-processing and failure to obtain a tight seal. Meat in cold storage spoils rapidly as the temperature rises; between 7° and 10° C. (45° and 50° F.) the rate of spoilage is greatly increased. Only strictly fresh meat should be cured or canned, as meat which has aged before preservation is undertaken tends to spoil more readily.

Precautions for using

Meat should never be used which in any way shows evidence of spoilage. As a precaution against possible harmful effects of bacterial action, home canned meat should be heated to boiling and maintained at that temperature for twenty minutes before serving. Cured meat should be thoroughly cooked.

ACTIVITIES

1. Can poultry and meats of various kinds.
2. Freeze poultry and meats of various kinds.
3. Cure pork.

Refer to *Practical Cookery*, "Home Preservation of Foods," pp. 239 and 241–243; Heseltine and Dow, *The Basic Cook Book*, "Home Canning," pp. 598–618; "Freezing," pp. 645–664.

PROBLEM 8 *What determines the kind and quantity of food to be preserved in the home?*

Today the extensive use of commercially processed foods has greatly reduced the quantity of foods preserved in the home. However many families with a home garden can, freeze, pickle or dry some of the products harvested. Others may buy the products and either because of a monetary saving or because of the quality of the home prepared food preserve it by various methods. Although considerable quantities of food are canned, pickled or made into jams, jellies, and preserves, freezing is undoubtedly the most popular method. Home freezers have contributed greatly to the convenience of this method. However, there are advantages to canning certain foods and they are ready to use without a preliminary thawing, therefore it seems unlikely that freezing will completely replace canning as a means of preserving foods. In deciding whether food shall be preserved in the home, due consideration should be given to certain important factors.

The cost of the raw food is probably one of the first points to be considered. The economy of large quantity preserving of any food is questionable if the cost of the raw food is extremely high. As a rule, if the cost is such that a given quantity of the finished product is much more expensive than a like quantity of commercially preserved food, the wisdom of preserving the food in the home is doubtful. An exception may be made, however, because of the food likes and dislikes of the group. Regardless of the quality, home and commercially preserved foods differ in flavor and texture. The group may so much prefer one class of foods to the other, that an extra expenditure of money is justified because of the greater enjoyment.

The food surplus is a second factor. The home garden or orchard may produce a quantity much above that which can be used in the home as fresh food. Often there is no local demand for such products, and neither the quantity nor the current price justify taking it to a more distant market. In such case, preservation in the home may be desirable, even in

excess of the family's food needs. A good market is sometimes found for home-preserved foods.

The personnel of the group is a third consideration. A significant saving may be made by preserving foods in season for a large group, because in such case the quantity handled may yield good returns on the time expended. Home preservation also presupposes free time for such activity on the part of the homemaker or of some other member of the group. It also assumes that interest and skill in the process are adequate to obtain a satisfactory product. Doubtless the woman who manages a home and also holds a full-time, wage-earning position will seldom consider food preservation in any quantity practical.

The equipment available is a fourth factor. The ease of doing the work and the success attained are dependent to some extent upon the equipment at hand and the homemaker's skills. It is recommended that the canning of non-acid foods such as corn or meat should never be undertaken without a pressure cooker.

Storage space is particularly important in the care of dried foods and of foods preserved by common storage. Even canned foods require a cool, dark place. The apartment-house dweller with limited space will seldom attempt to preserve foods in any quantity, but the person who lives in a large house with a spacious attic and a roomy basement may preserve foods in larger amounts.

Sometimes losses of home-preserved foods occur. In such cases, the cause of the losses should be determined and the difficulty overcome, or preservation of the particular food by that method should not be attempted.

If food is to be preserved at home, the needs and tastes of the group will to a great extent determine the quantity and kind. As preserved vegetables and fruits are the usual substitute for fresh ones, special consideration might well be given the budget for these foods. For convenience it is based upon the amount of vegetables and fruits needed for one person for thirty weeks. To find the amount needed for a group, multiply these figures by the number in the family. If fresh vegetables and fruits are used, an estimate should be made of the amounts, and this item should be deducted from the suggested budget. Meat is not included in this budget, but for those who preserve meat it is an important item.

Budget for Food Preservation for One Person for Thirty Weeks

Tomatoes, 10 quarts *
Greens, 5 quarts
Green beans, 6 quarts
Peas, 5 quarts
Corn, 5 quarts
31 quarts — total canned and frozen vegetables per person.

Rhubarb, 2 quarts
Berries, 3 quarts
Cherries, 3 quarts
Peaches, 10 quarts
Pears, 2½ quarts
Plums, 2½ quarts
23 quarts — total canned and frozen fruits per person.

Squash, 10 pounds
Carrots, 10 pounds
Beets, 7 pounds
Turnips, 6 pounds
Onions, 8 pounds
Cabbage, 20 pounds
Parsnips, 4 pounds
Apples, 36 pounds
101 pounds — total stored fruits and vegetables per person.

Prunes, 5 pounds
Raisins, 2 pounds
Apricots, 1½ pounds
Peaches, 1½ pounds
Figs, 1 pound
Dried corn, 1 pound
12 pounds — total dried fruits and vegetables per person.

* If citrus fruits are not to be included in the diet, the allowance for tomatoes needs to be increased.

REFERENCES

Cruess, William V., *Commercial Fruit and Vegetable Products*, second edition. New York: McGraw-Hill Book Company, 1938.

Department of Foods and Nutrition, Kansas State College, *Practical Cookery and the Etiquette and Service of the Table.*

Fabian, Frederick W., *Home Food Preservation.* New York: The Avi Publishing Company, 1943.

Gortner, W. A., F. S. Erdman and N. K. Masterman, *Principles of Food Freezing.* New York: John Wiley and Sons, Inc. 1948.

Heseltine, Marjorie, and Ula M. Dow, *The Basic Cook Book.*

Lowe, Belle, *Experimental Cookery.*

Prescott, Samuel C., and Bernard E. Proctor, *Food Technology.*

Sweetman, Marion Deyoe and Ingeborg MacKellar, *Food Selection and Preparation.*

Tressler, Donald K., and Clifford F. Evers, *The Freezing Preservation of Foods.* New York: The Avi Publishing Company, 1947.

Tressler, Donald K., Clifford F. Evers, and Barbara Hutchings Evers, *Into the Freezer — And Out.* New York: The Avi Publishing Company, 1953.

Unit Five

UNIT FIVE

Planning, Preparing and

Courtesy of International Silver Comp

IN PREHISTORIC AGES, the human diet included meat from the hunt, fish from the net, honey from the hollow tree that housed the bees, and berries and roots from the woods. There was little or no preparation of food and

Serving Meals

no formality in serving. The time of eating was a matter of individual inclination and of available food supply. If there had been a good kill and there was an abundance of food on hand there would be gorging; if there was little there would be starving.

Later, when the food supply did not depend directly on the day's hunting or fishing and some preparation was deemed desirable, a routine time for eating appears to have been established as a part of the household ritual. The Anglo-Saxons, the Romans, and the Normans all seem to have had three meals a day, although there was little similarity in either the hours observed or the type of food served. In England, dinner, the chief meal of the day, was the first to have a fixed hour. By Queen Elizabeth's time, the English nobility had set the hour for dinner at eleven and for supper at five. The partaking of food at a set hour to "break the fast of the night" became an accepted custom among some families, and, by 1512, this meal was designated by the term breakfast. By the middle of the sixteenth century this was a generally accepted meal in England.

Eating and drinking were among the chief pleasures of life during the Middle Ages, and the amount of time and energy spent on the preparation of food was indeed great. In some of the castles, the kitchen staff numbered twenty or more, for a great deal that is done in a present-day kitchen by mechanical means had to be achieved by human effort. The difficulty of cooking over uncertain fireplaces, which made constant attention necessary, was one of the reasons for the large staff, though perhaps the character of the food was the chief cause. Every food was pounded and spiced out of all recognition, the success of the dish depending upon the depth of the disguise. Much labor was spent upon dinner, which from that day to this has remained the chief meal, even though for many people its time of serving has shifted from noon to six or seven o'clock in the evening.

One authority states:

> The ordinary dinner of a respectable citizen in the middle of the fifteenth century consisted of soup, two or three plain dishes of meat, followed by cheese, pastry, and fruit. This practice of eating cheese before pastry is still common in some parts of France, and is occasionally seen in England. Meat pies, too, were very common articles of food in the Middle Ages. . . .[1]
>
> The perfect dinner of this time consisted of three courses, each terminated by an elaborate device in confectionery, which was termed a "subtlety." The bill of fare for such a dinner might have been:
>
> The first course: A whet of brawn with mustard, followed by potage, stewed pheasants, stewed swan, baked venison, and a device or subtlety.
>
> The second course: A meat blancmange, roast venison, roast peacock, egrets, small birds or sucking rabbits, small pasties, and poached fritters, ending with another subtlety.
>
> The third course: An almond cream, snipe, quails, or sparrows roasted, crayfish baked, quinces with sage fritters, another device, and then dessert.
>
> Ypocras marked the time for leaving the table. It consisted of wine with spices and sugar strained through a cloth. The drink is said to have taken its name from the strainer which apothecaries fancifully called Hippocrates' sleeve. Grace was then said, and the guests once more washed their hands as soon as the table had been protected with the surnape.

Supper, a subordinate meal, according to rule, was not to be served until seven hours after dinner. It was also a lighter meal.

As time passed, the difference between supper and dinner became less marked. By the middle of the nineteenth century, the evening meal, in the kind and quantity of food served, often assumed the magnitude of dinners of old. This is shown by the description of a supper actually served the members of the Old South Church in Boston, on the occasion of the ordination of a new pastor in 1861.

> There were six tables that held one with another eighteen persons each, upon each table a good rich plumb pudding, a dish of boil'd pork and fowls, and a corn'd leg of pork with sauce proper for it, a leg of bacon, a piece of alamode beef, a leg of mutton with caper sauce, a roast line of veal, a roast turkey, a venison pastee, besides chess cakes and tarts, cheese and butter. Half a dozen cooks were employed upon this occasion, upwards of twenty tenders to wait upon the tables; they had the best of old cyder, one barrel of Lisbon wine, punch in plenty before and after dinner, made of old Barbados spirits.[2]

[1] Sir D'Arcy Power, *The Foundations of Medical History*, Baltimore: The Williams and Wilkins Company, 1931. Quoted by special arrangement with the publishers.

[2] Alice Morse Earle, *The Sabbath in Puritan New England*. New York: Charles Scribner's Sons, 1909. Quoted by special arrangement with the publishers.

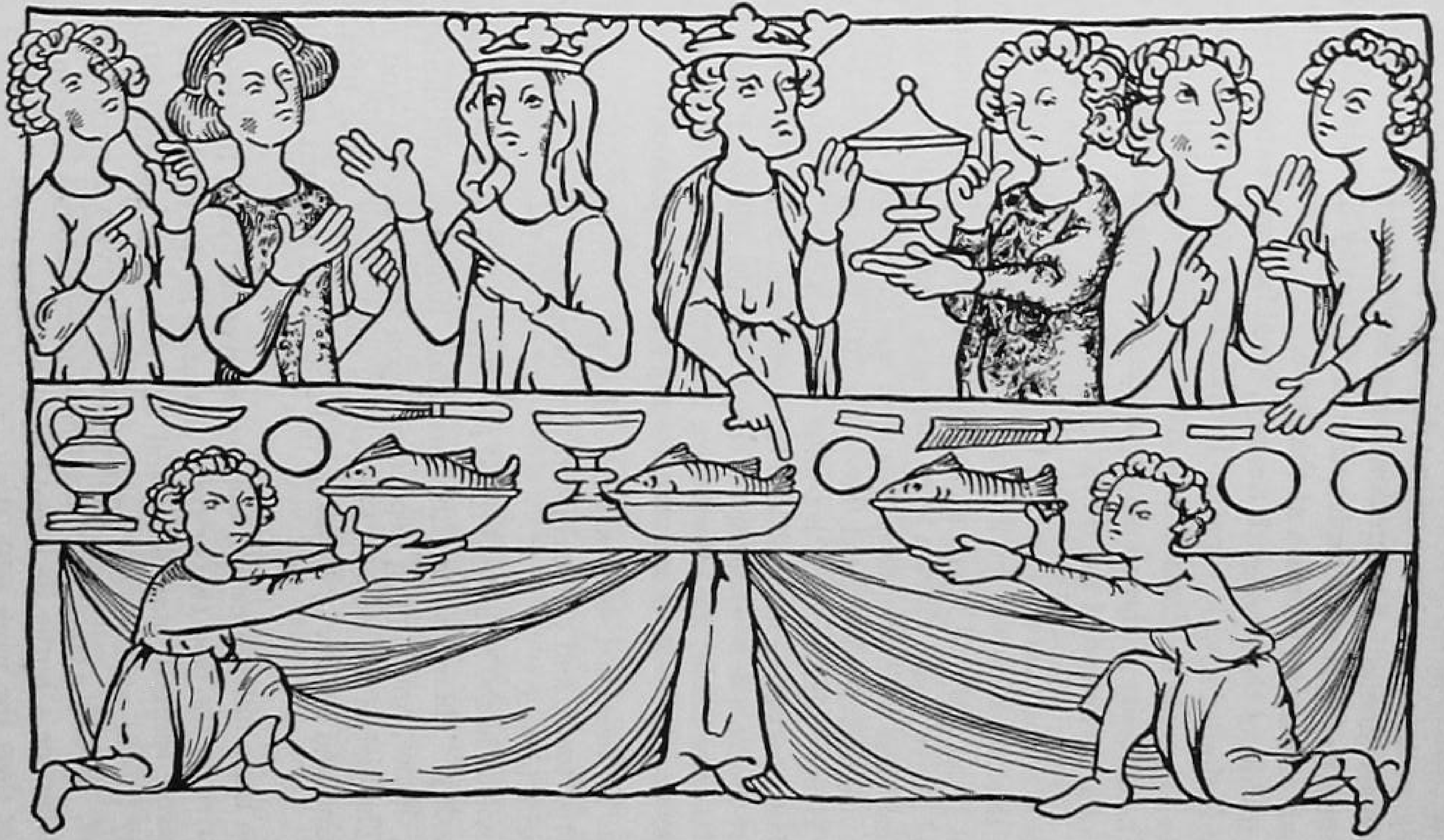


Fig. 132

Trenchers, large loaves of bread which were important food in most meals, for a long time served also as plates.

A diet in which such dinners and suppers were usual would be overwhelmingly protein in nature and would make little provision for the foods now held essential. The breakfasts scarcely corrected the error. In this fact may be found some explanation of the many dietary disorders, both chronic and acute, common at that time.

By the middle of the nineteenth century, breakfast was extensively accepted, and afforded a wide variety. Breakfasts served in the homes of the well-to-to people in England and America alike included numerous dishes. The diversity of these is shown in the following description of the breakfast of a clergyman of the times:

> The tea consumed was the very best, the coffee the very blackest, the cream the very thickest; there was dry toast and buttered toast, muffins and crumpets; hot bread and cold bread, white bread and brown bread, home-made bread and bakers' bread, wheaten bread and oaten bread, and if there be other breads than these they were there; there were eggs in napkins, and crispy bits of bacon under silver covers; and there were little fishes in a little box, and devilled kidneys frizzling on a hot-water dish; — which, by-the-bye, were placed closely contiguous to the plate of the worthy arch-deacon himself. Over and above this, on a snow-white napkin, spread upon the sideboard, was a huge ham and a huge sirloin; the latter having laden the dinner table on the previous evening. Such was the ordinary fare at Plumstead Episcopi.[1]

Such fare for breakfast seems absurd today when orange juice, poached egg, buttered toast, and coffee constitute a breakfast deemed worthy of one's favorite bishop.

The provision in the household ritual for three meals daily still holds in America today. These may be either breakfast, luncheon, and dinner, or breakfast, dinner, and supper, depending upon local customs and other factors. The diet of the present, however, is unlike that of the past, differing in kind and variety of dishes served and in the amount regarded as a portion.

Great as these differences are, they seem overshadowed by those that have occurred in the past two or three centuries in the kitchen, its plan, its equipment, sanitary standards, and the personnel assuming the responsibility for the work of food preparation and service carried on in today's home. In only a small percentage of American homes is there a cook in the kitchen or a butler or a maid in the dining room. Usually the homemaker does the work with the assistance of the family members. The kitchen is planned and equipped to contribute to family work, living,

[1] Anthony Trollope, *The Warden.* New York: Dodd, Mead and Company, 1913, pp. 94 and 95. Quoted by special arrangement with the publishers.

and enjoyment. In the average home the use of labor-saving devices from electric ranges and refrigerators to egg beaters and meat thermometers combine with a large consumption of prepared frosted foods to reduce markedly the time and human energy needed for the tasks of food preparation and service.

PROBLEM 1 *How has American social usage evolved?*

Since before the development of "civilization" as we know it, the contact of one person with another and that of a person with the group — in fact, all the life of human beings in all stages of culture — has been primarily controlled by a vast mass of folkways handed down from the earliest existence of the race and developed to facilitate satisfactory human relationships. Probably they were at first merely ways of doing things to satisfy human needs and desires current in primitive society. From ways of doing, these procedures became habits, then customs accepted without reflection as important ceremonials, and so they have remained, perhaps in modified form, for thousands of years after their introduction. The influence of folkways in our daily living is shown by the comment that "Custom regulates the whole of a man's actions — his bathing, washing, cutting his hair, eating, drinking, and fasting. From his cradle to his grave he is the slave of ancient usage. In his life there is nothing free, nothing original, nothing spontaneous."[1]

It is easy to see how the service of food came under the rule of custom. Food and feasting have entered largely into the social life of human beings since earliest time. Joy over marriages, births, honors, and victories was expressed by feasting in which the presence of guests added to mirth and happiness. Grief over the death of loved ones was marked by the funeral feast, or wake, a ceremony less common today than in earlier times. The service of food, then, has ever been associated with intimate human contacts.

Customs

Customs, including those pertaining to food, are sustained through the

[1] William Graham Sumner, *Folkways*. Quoted by special arrangement with the publishers.

satisfactions which they afford. All groups of past or present, even those whose customs now seem queer and inferior to our own, have found satisfaction in their idea of correct social usages. The "goodness" or "badness" of such practices depends wholly upon their adjustment to the conditions of life and the interests of people living in a given time and place. It is a sign of satisfactory adjustment when the rules are not questioned and all members of the group conform to them seemingly instinctively. Conformity is exacted directly of a person through the fear of being ruled out of the group. He pays this price of agreement for "belonging" or for his sense of inclusion. The force of compulsion in social usage is evaluated by Cooley as follows: "Every variant idea of conduct has to fight its way; as soon as anyone attempts to do anything unexpected the world begins to cry, 'Get in the rut! Get in the rut! Get in the rut!' and shoves, stares, coaxes, and sneers until he does so — or until he makes good his position, and so, by altering the standard in a measure, establishes a new basis of conformity." [1]

To the extent that ceremonials prescribed by custom are helps rather than hindrances in daily living, they are fostered and observed; they are "right." To the extent that they prove ill-adapted, they are liable to change. They have become "wrong," and when many people fail to observe them, they yield to change, and new social usages replace the old.

Etiquette

Now and again in the course of the centuries, so complicated has social usage become that there have been published numerous volumes, classified under the general term "etiquette," which set forth correct social procedure. Ponderous books of etiquette written by a wide variety of authors, including priests, laymen, Louis X of France, and even Napoleon, have all had for their purpose the direction of conduct for practically all events and human contacts common to persons in polite society.

Count D'Orsay, a Frenchman, whose famous book on etiquette was long held authoritative, stated that good manners come not from the heart but from the mind, and he defined etiquette as "the barrier which society draws around itself as a protection against offences the law cannot touch." [2]

The importance attached by the English to social usage is well typified

[1] Charles Horton Cooley, *Human Nature and the Social Order*. Quoted by special arrangement with the publishers.

[2] Quoted by R. L. Phillips in "Etiquette, Old and New," *Bookman* 62:259, November, 1925.

by the admonitions given in Lord Chesterfield's *Letters to His Son*. In one of these oft-quoted epistles appears the following statement: "Politeness and good-breeding are absolutely necessary to adorn any, or all other good qualities or talents. Without them, no knowledge, no perfection whatever, is seen in its best light. The scholar, without good-breeding, is a pedant; the philosopher, a cynic; the soldier, a brute; and every man disagreeable."[1]

The detail in which social ritual has been established and the probability of a breach of etiquette and attendant discomfiture on the part of the uninformed is pointed out by Lord Chesterfield in the following words:

> When an awkward fellow first comes into a room he goes and places himself in the very place of the whole room where he should not; there he soon lets his hat fall down, and in taking it up again, throws down his cane; in recovering his cane, his hat falls a second time, so that it is a quarter of an hour before he is in order again. If he drinks tea or coffee, he certainly scalds his mouth, and lets either the cup or the saucer fall, and spills either the tea or coffee on his breeches. At dinner, his awkwardness distinguishes itself particularly, as he has more to do; there he holds his knife, fork, and spoon differently from other people, eats with his knife, to the great danger of his mouth, picks his tooth with his fork, and puts his spoon which has been in his throat twenty times, into the dishes again. If he is to serve, he can never hit the joint; but, in his vain efforts to cut through the bone, scatters the sauce in everybody's face. He generally daubs himself with soup and grease, though his napkin is commonly stuck through a buttonhole, and tickles his chin. When he drinks, he infallibly coughs in his glass, and besprinkles the company. All this, I own, is not in any degree criminal; but is highly disagreeable and ridiculous in company, and ought most carefully to be avoided, by whoever desires to please.[2]

Table manners

All people at all times tend to establish rules governing the partaking of food and making of social contacts. Some of the rules of days past are honorable forebears of those accepted today.

The *Book of Curtesys*, published in 1447, admonishes:

> Bleve not in your drinks ne in youre potage
> Ne forsith not your disshe to full of brede
> Ne bere your knyfe toward your visage
> Fore theren is parell and maketh drede.

[1] *Letters to His Son*, Letter CXXVIII.
[2] *Letters to His Son*, Letter CXXVIII.

Fig. 183

The medieval dinner shown here illustrates social usages radically different from those generally practiced today.

More than a hundred years later Hugh Rhodes in his *Boke of Nuture* advises:

Suppe not loud thy pottage
No tyme in all thy life
Dip not thy meat in the salt cellar
But take it with thy knife.

Pick not thy teeth with thy knife,
Nor with thy finger ends
But take a stick or some clean thynge
Then you do not offend.

The art of eating with propriety has evolved slowly, the emphasis shifting as plates, knives, spoons, and forks in turn became available. The story of how people managed their food with such nicety, lacking plates and forks, is of interest.

Many of our rules concerning table service hail from the castles of medieval times where a retinue of servants in the livery of the house served the feasts and dinners. The large number of people engaged in the food service of a household of that time, and the probable resultant ritual, becomes clear from George Cavendish's description of the staff employed for these duties by Cardinal Wolsey:

> Now in his privy kitchen he had a Master Cook who went daily in damask, satin, or velvet, with a chain of gold about his neck; and two grooms, with six labourers and children to serve in that place; in the Larder there, a yeoman and a groom; in the Scalding-house a yeoman and two grooms; in the Scullery there, two persons; in the Buttery, two yeoman and two grooms with two other pages; in the Pantry, two yeoman, two grooms, and two other pages, and in the Ewery likewise; in the Cellar, three yeoman, two grooms, and two pages; beside a gentleman for the month; in the Chaundery, three persons; in the Wafery, two; . . . in the Bakehouse, a yeoman and two grooms. Then had he of Gentlemen, as cupbearers, carvers, sewers, and Gentlemen daily waiters, forty persons; of yeoman ushers he had six; of grooms in his chamber he had eight; of yeoman of his chamber he had forty-six daily to attend upon his person; he had also a priest there which was his Almoner, to attend upon his table at dinner.[1]

Though the home of the "respectable" citizen of the time had only a fraction of this number of employees, it still boasted three or four whose chief duty was the food service of the household. The ritual could, then, be far more formal than in the average American home with perhaps one maid of all work, or, more commonly, none.

[1] Quoted by William Mead, *The English Medieval Feast*, pp. 146–47.

In olden times, places at the table were assigned by rank, the seats of honor being those nearest the host. This is perhaps the origin of the present seating arrangement and use of place cards. After the guests were seated, before they ate or drank, the food and drink were tasted at the table by persons of high rank, to show that they were free from poison. Doubtless from this custom is derived the rule that the hostess shall be served first and shall taste the food first. Modification of this rule of other centuries is now being made and the hostess is often served last. Food was served in courses then as now. The medieval host designated that the meal was at an end by rising, a practice reflected in present-day usage.

The observance of an established order in the meal service offered advantages as it does today. It reduced the service to a routine understood by guests and servants alike, and eliminated the confusion of numerous considerations and special instructions. The successful following of complicated accepted forms then gave a sense of satisfaction to the titled and the rich. Even though the elaborate ritual of other days seems ponderous, the importance of some ceremony with the taking of food can scarcely be questioned. By its use, eating becomes not mere feeding, like that of an animal, but an act of social significance by which a person's enjoyment in life is increased. At the same time ceremony creates a condition in which the taking of food and its use are both bettered.

The American pattern

In colonial days, the early settlers, English, Dutch, and French, brought to this country fundamental social concepts: the customs and social usages that form the basis of our present practices. In American social usage or etiquette courtesy is the first fundamental social concept. Courtesy and consideration of the rights of others are often regarded as synonymous — perhaps rightly so. The unobtrusive respect for another's opinion, the observation of all the rights of another, and a regard for all the usages by which human contact is safeguarded are all included under courtesy. This is a social concept that has come to us from our English and European forebears, but has been somewhat changed by the character of colonial life. The constant struggle to establish homes and to sustain life in a new country practically leveled, in New England at least, barriers between classes. Simplicity in living, kindliness, and generous hospitality are held to be characteristic of the early colonists, and to be to some extent the true basis of American etiquette today.

In America there are relatively few families that have the number of

servants necessary for a strictly formal way of living. The lack of servants may commonly prevent an elaborate ritual of meal service, but there is no home in which some ceremony cannot bring its touch of nicety to the daily meals. The simplest ceremony will provide, as did the ritual of medieval times, for an orderly spread table and the prompt appearance of those who share the meal. It will limit the table conversation, as was done of old, to that which is pleasant and impersonal. The innovation lies in the fact that what once was the responsibility of servants often becomes the shared responsibility of the group, with an accompanying simplification of practices. The members of the group, however, should carry their duties with an ease that gives to the service something not to be brought by menials.

It has sometimes been said that we Americans tend to live in an informal way. The proximity of our houses, the tiering of homes in apartments, the daily marketing by the homemaker, and the daily employment of the husband, and increasingly the wife, in an office, shop, or factory are regarded as contributing to our state of informality. Formality and informality are relative terms. What may seem informal to one group is regarded as formal by another, whether it concerns mode of life, dress, or table service.

Economic level

The prevailing economic level of any country is also a large force in determining what its social usage shall be. In this country, more than in any other, there tends to be a distribution of wealth in which many families enjoy a relatively high standard of living while family members participate in the work of the household, the office, the store, the farm, or the garage. Even among families of moderate income, the work formerly done by a maid is now performed by electric labor-saving devices. In a society without servants much of the former social ritual has lost its significance.

Notwithstanding the trend, however, as the years have passed, America seems to have adhered to some extent to the theory of a leisure class, but has substituted for the aristocracy of birth, one consisting largely of esteem for families who have acquired wealth. In the substitution of the aristocracy of wealth for that of birth there was, among possible gains, a loss. The aristocracy of birth had tested its code of etiquette, whereas the "newly rich" have not subjected theirs to any test. The realization of this lack tends to make them lean heavily on old rules and delay necessary adjustments. Furthermore, the attempt of the American who must earn

his own living to emulate the practice of this small leisure class has not resulted in sane, satisfactory social adjustments. It is not surprising that there should result from the maladjustment some overassertive and mannerless persons sometimes spoken of as "typical Americans."

Social equality

With our idea of political equality, Americans theoretically do not recognize that any one group is superior to another. Political equality is supposedly accompanied by social equality. It has been said that a citizen of a monarchy may be scrupulous concerning the rights of others, but that he does not regard the rights of others as equivalent to his own. To be in accord with American ideals of equality, courtesy, which is the consideration of the rights of others, should ascribe to other persons equal rights with those which one claims for one's self. Through this interpretation of courtesy were lost the definitely established classes for which standards of conduct functioned with the rigidity found in older countries.

Eventually, the idea of human equality was extended to the elimination not only of class and political distinctions but also of the social, economic, and political discriminations between sexes. Women received, not all at one time, but almost within one generation, the right to work in an office, side by side with men, to share in the satisfactions of professional life, and to assume the responsibilities of citizenship. When this happened it was bound to have an effect on the social usage of our time.

Lack of interest

Our observance of etiquette is also influenced by the diversity and interest in the life about us that has led men, and now to some extent women, to lack deep interest in maintaining social ritual. Since a deep interest will cause nonconformity to the former code to be noticed and disapproved, indifference tends to destroy one of the mainstays of conformity to the ritual of the past. In this country, people tend to regard deviations from the ritual as personal idiosyncrasies rather than matters for approval or disapproval. The emergence of distinctly American social usages has been further complicated and delayed by immigration from many different countries with conflicting cultures. Immigrants, clinging to the customs of the home land, bewildered in the noisy city, feel the loss of the assurance ordinarily derived from effective social ritual, and their children often add to rather than detract from the problem of evolving an adequate American code.

Personal responsibility

From the foundation of regard for courtesy, kindliness, and equality in human relations, there should develop American social usages which would be expressed in good manners, which have been defined as follows: "Good manners are the means of expressing consideration for the feelings of others." There is need for scrutiny of the old forms in terms of their usefulness today in expressing this consideration.

If a person approaches the accepted code with a critical attitude, he will first wish to determine what points of current accepted usage which give other people ease, satisfaction, and assurance he has made his own and on what points he differs. When the points of difference are clearly in mind, he must decide whether the issue is important enough to him personally to justify him in taking energy and interest to maintain his individualistic stand, and in causing, perhaps, inconvenience to others. To have a conspicuously individual way of doing everything is impossible for a sane person, and to attempt it would be to do oneself unnecessary injury by separating one from his fellowmen. Strength and energy should be saved for matters in which conviction forces one to insist upon his way. The responsibilities for the scrutiny of old forms of social usage and for schooling in good manners are, in this country, largely personal matters, concepts characteristically American. However, in a number of areas of living certain manners are generally accepted and table manners are among these.

Some commonly accepted table manners

Sit down and rise from left side of chair at the table. Do not begin conversation until after grace is said or until you see that it is not to be said. Carry on table conversation in a low, well-modulated voice. Make a special effort to include your neighbors at the table in conversation which will be of interest to all. Jonathan Swift admonishes host and guest alike to remember:

> Conversation is but carving!
> Give no more to every guest
> Than he's able to digest.
> Give him always of the prime,
> And but little at a time.
> Carve to all but just enough,
> Let them neither starve nor stuff,
> And that you may have your due,
> Let your neighbor carve for you.

Avoid loud talking or a tendency to monopolize the conversation, as these are indications of bad manners. Also avoid arguments and unpleasant topics. If these are accidentally introduced, change the conversation to more pleasant topics as soon as possible.

Sit erect in your chair at the table without resting your arms on the table, or crowding and inconveniencing your neighbor.

Glance at the hostess and adopt her method whenever in doubt as to what to do.

Spread the napkin, if large, half unfolded upon the knees with the open side toward you. This permits touching the lips with it, without soiling the outside of the napkin. With the smaller size, it is permissible to unfold it completely. Leave the napkin on the lap at the close of the meal until the hostess has placed hers.

Touch the lips with the napkin as needed.

At the end of the meal place the napkin loosely beside the plate if you are a guest for but a single meal. If a guest for more than one meal, observe the hostess and follow her example. When called from the table place the napkin loosely on the table at the left side of the plate.

If the number being served is small, wait until all at the table are served before beginning to eat. If the group is large or if seated at a long table, one should start to eat when the serving of those seated immediately adjacent is completed.

When eating soup, the spoon is dipped away from the person, and the liquid is sipped from the side.

As a rule a dish is not tipped to obtain the last of the food. Occasionally a nearly empty soup plate may be tipped slightly away from one.

Eat slowly and quietly, never talking with food in the mouth. Take small bites.

Take care to finish a course at about the same time as the others at the table.

Place used silver on the dish to which it belongs and not on the tablecloth. Keep the tablecloth as clean as possible.

Break bread into small pieces as needed, spreading each as eaten. Lay it on the bread-and-butter plate, or, if this is not provided, on the dinner plate. Place butter, jelly, celery, olives, and similar foods on the bread-and-butter plate if this is used.

Express some preference for a food when you are consulted. It may be a trivial matter to you, but it will aid the one who serves.

Accept a course even if you do not care for it. Eat whatever part of it you desire, trying to eat some. If necessary, leave it untouched, but

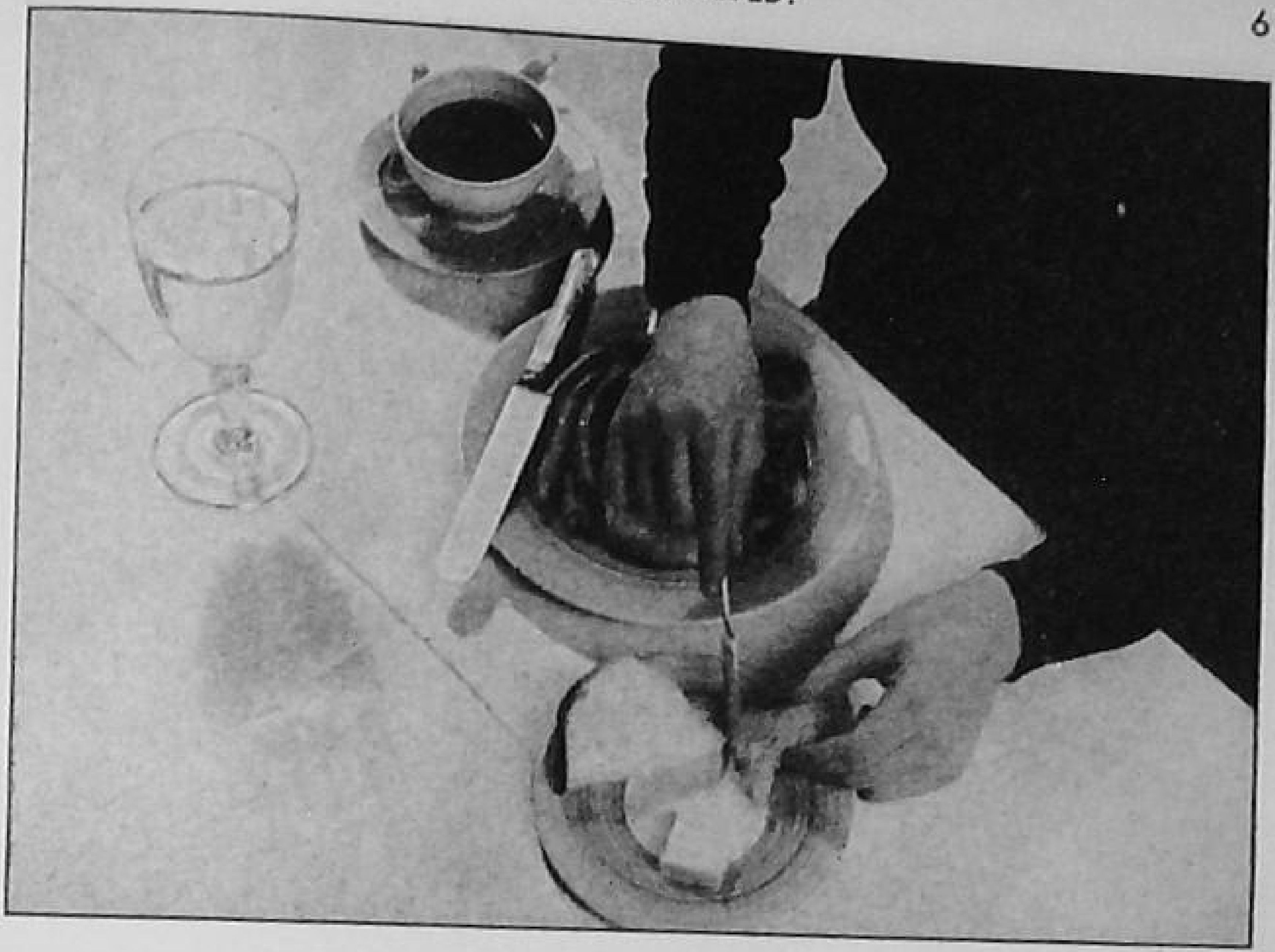


Fig. 134

Bread is broken into small pieces before it is buttered.

do not give the impression of being neglected. A little more attention to conversation on your part may prevent those about you from noticing that you do not eat some of the food.

Take the last helping of any dish which may be passed to you if you desire. It is quite proper, and to refrain looks as if you doubted the supply.

Accept a second helping of a dish if it is offered at an informal meal unless it would appear to delay the service. At a formal meal a second helping is never offered and one never asks for it.

Do not reach in front of a person to obtain a desired article; ask to have it passed.

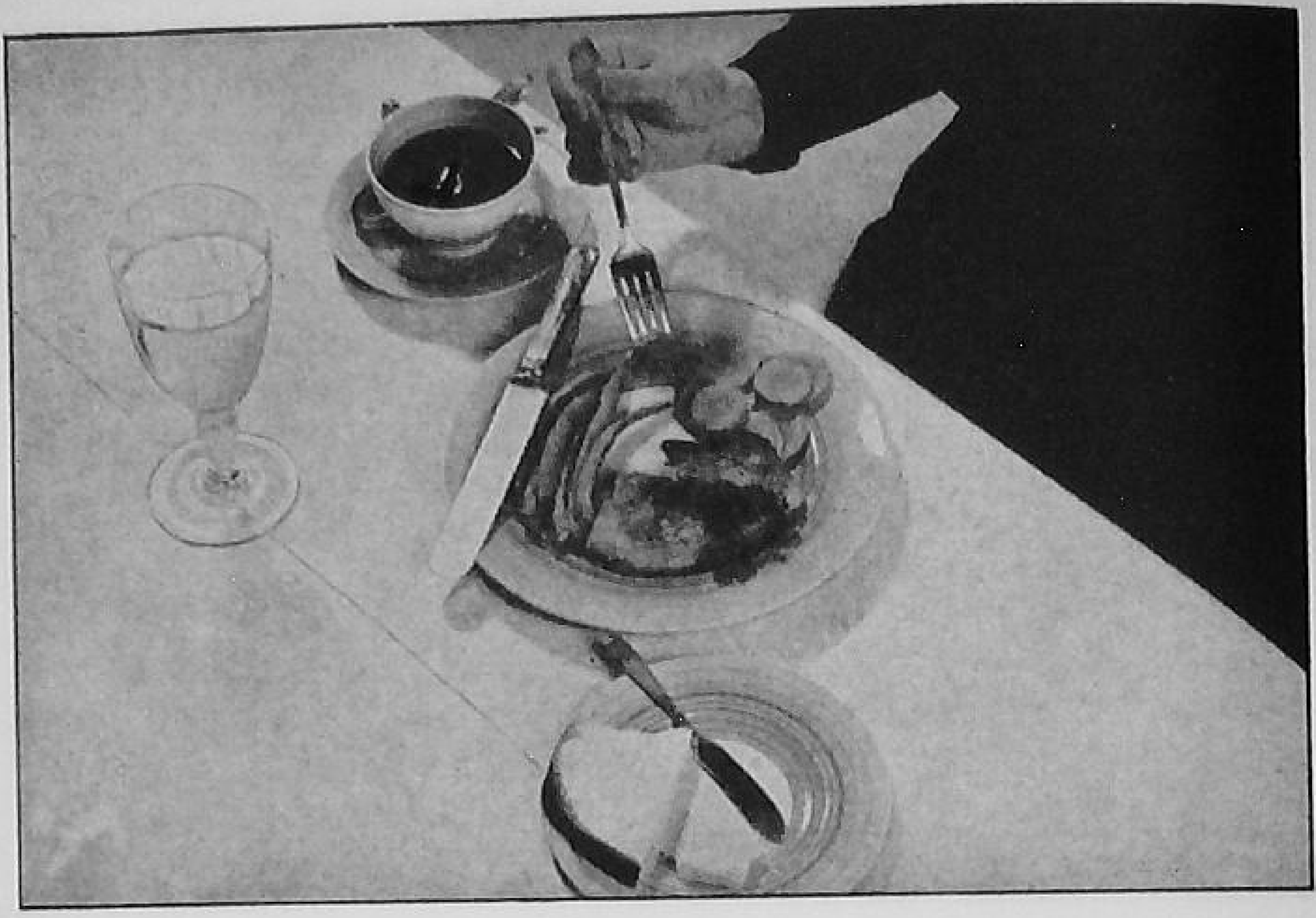
Speak quietly to the waitress when she is near if it is necessary to ask for anything during the meal.

Ask to be excused before leaving the table.

Dip only the finger tips, one hand at a time, in using the finger bowl. Dry the water gently from the finger tips with the napkin.

Do not touch the hair while at the table.

Avoid the use of a handkerchief at the table. When it must be used, do so as quietly as possible.



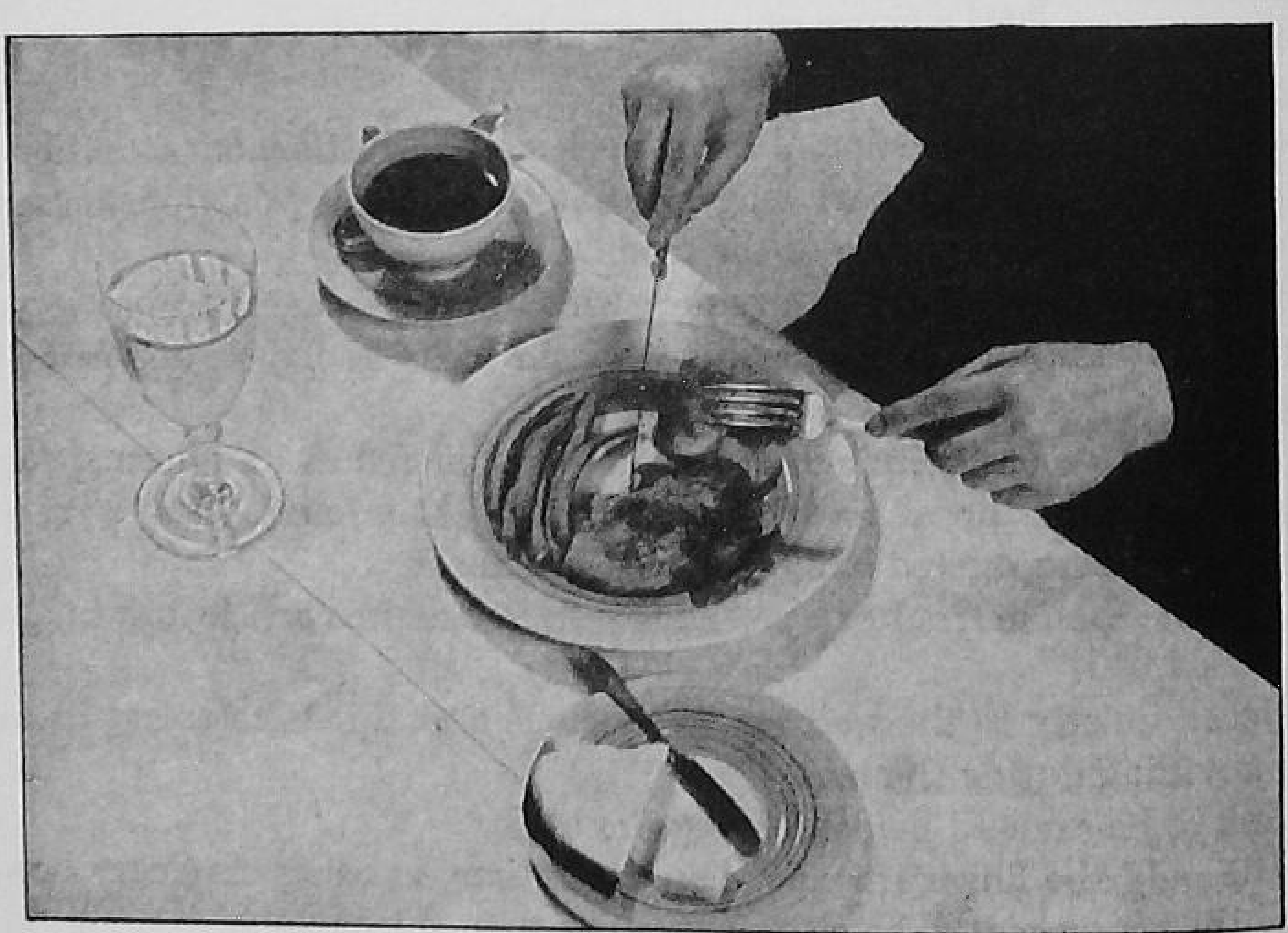


Fig. 135

The accepted way in America of conveying food to the mouth is shown in the illustration above; the accepted way in England and on the continent in the illustration below.

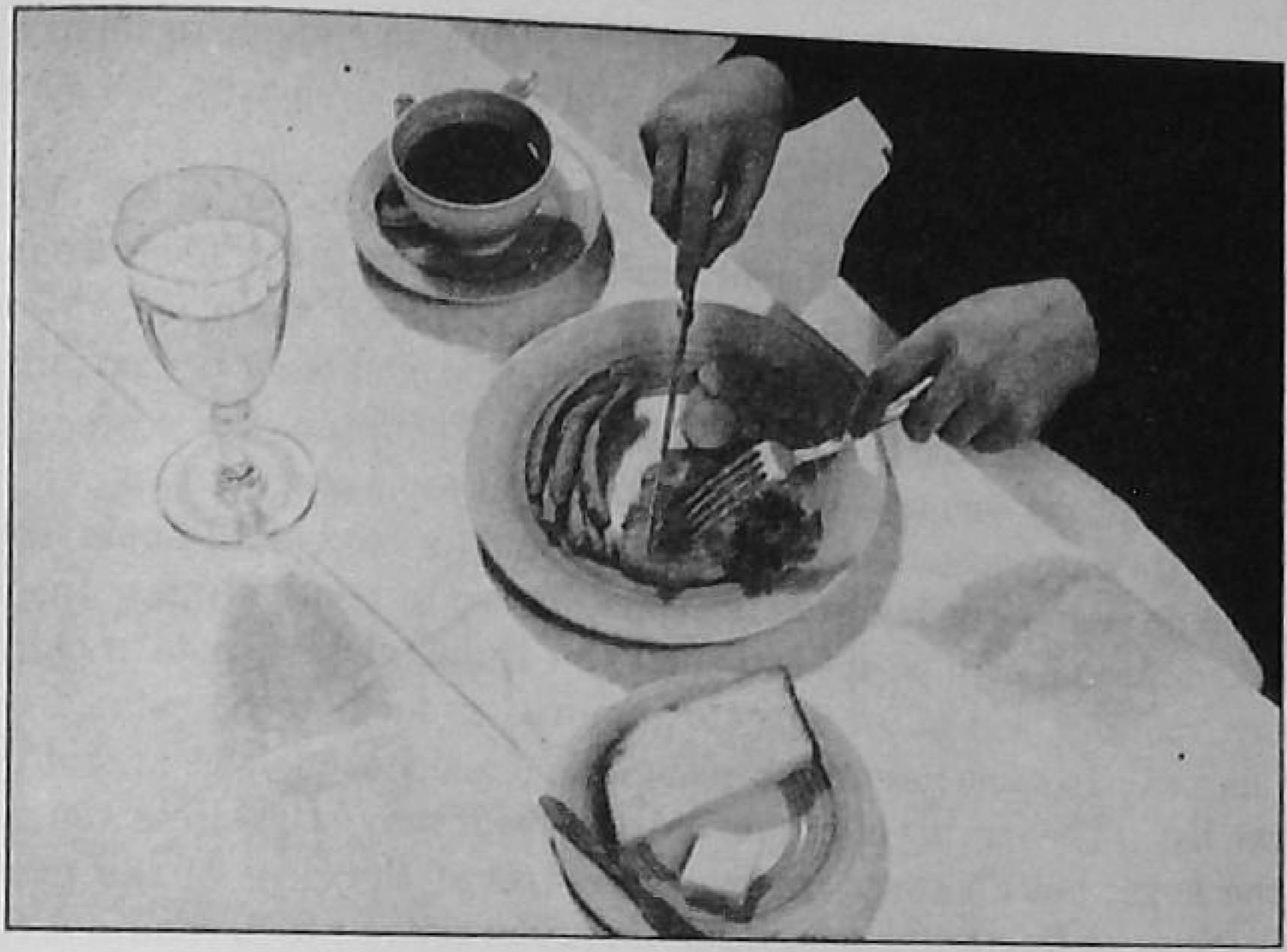


Fig. 136

The knife and fork are held while cutting food as the above picture indicates.

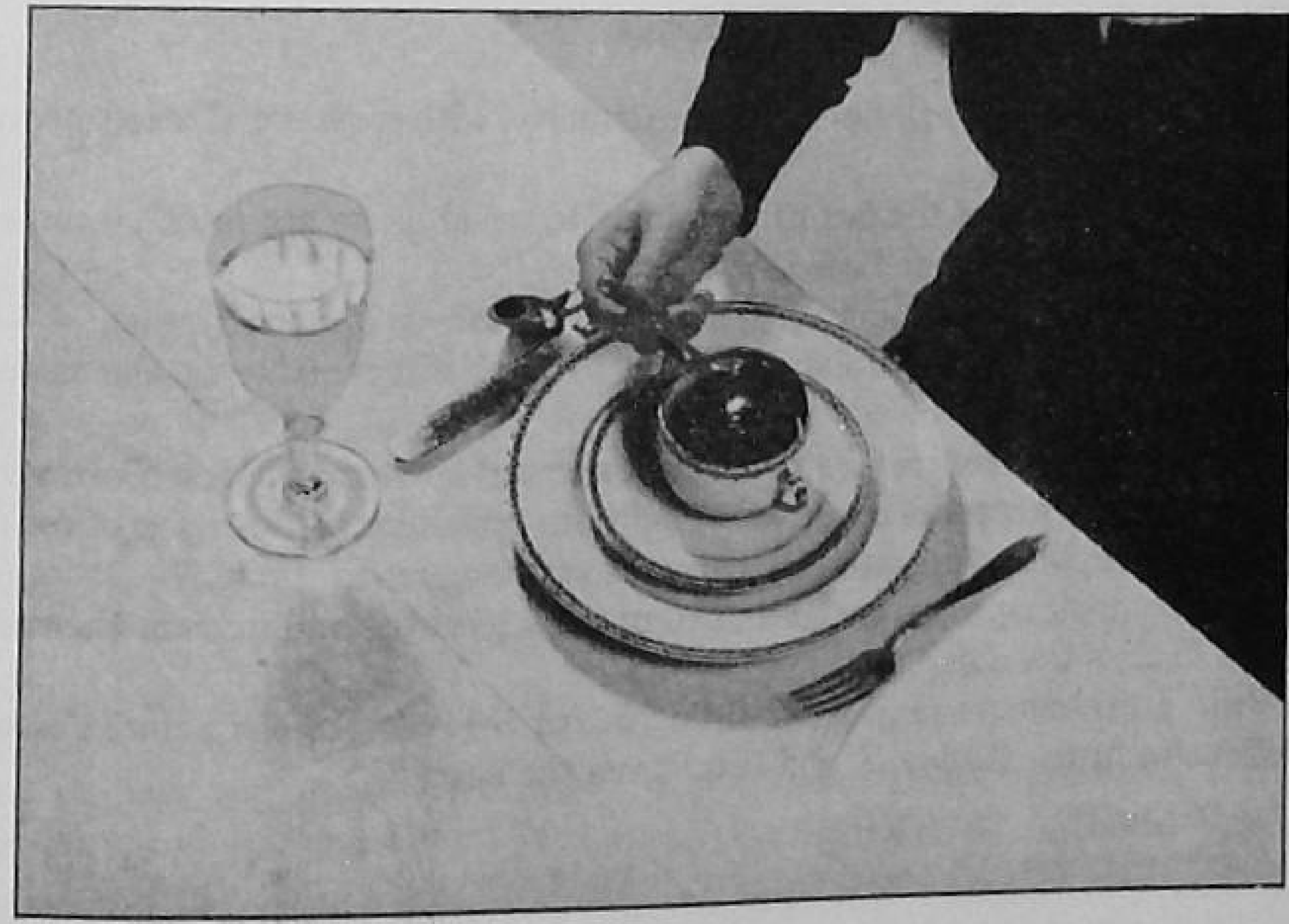


Fig. 137

When eating soup, one should hold the spoon in the manner shown above.

Express your regrets to the hostess if unfortunate enough to have an accident at the table. The hostess should courteously accept the apologies offered and promptly turn the conversation.

Criticizing or ridiculing local forms of etiquette is discourteous. Elderly people or people from different localities or countries are likely to use customs different from the established ways of the day or the place. Manners change several times even within a generation, and older persons may be merely following the customs of their day. Then, too, the passage of time has brought changes in table manners and table service.

From the early custom of the use of the hand for food of all kinds from stew to dessert, we today have restricted its use to relatively few foods. Crackers, bread, corn on the cob, most raw fruits, pickles, potato chips, celery, radishes, and salted nuts are approved as foods to be eaten from the fingers. In some localities, asparagus and artichoke leaves are added to the list. The serving of certain of these foods may necessitate the use of the finger bowl between courses, as well as at the close of the meal. This seems an interesting refinement of ancient usage which required the washing of the hands of all persons seated at the table during and at the end of the meal. In doing this, water was poured from a pitcher over their hands into a basin, after which a towel or napkin was supplied each person.

ACTIVITIES

1. List the various nationalities in your community, with some social usage characteristic of each.
2. Show how certain of the factors pertaining to social usage are most powerful in *urban*, *rural*, *army*, and *college life*.
3. Explain how the economic level of a community affects its social usage.
4. Determine what tribal ritual pertaining to food still remains in the usual wedding festivities.
5. Choose one of the festive days of the year, such as Christmas or New Year, and determine the sources of some of the traditions pertaining to the usage of food.
6. Suggest possible points on which current social usage is changing.
7. Describe differing social usages in two or more localities and explain the reasons back of the differences.
8. Write a five-minute radio talk, distinguishing between the characteristics of etiquette "from the head" and that "from the heart."

PROBLEM 2 *What constitutes a good meal?*

An observant traveler tells of a middle-aged couple who, while breakfasting in a railway station on coffee and doughnuts, expressed concern at the "soda-pop" and chocolate-bar breakfast eaten by a young woman seated near-by. Their reaction indicated that their standards were being violated by their neighbor's practice. In turn their practice might violate the standards of others, despite the fact that the breakfast they had ordered is not uncommon at any lunch counter at the morning hour. Obviously, neither the familiarity of a given breakfast menu, nor yet the dictates of a capricious or fickle appetite, should be depended upon to determine a wise selection of foods. More than forty years ago the error in such a reliance was pointed out by Ellen H. Richards in the following statement: "It is unsafe to trust the individual to the guidance of the appetite alone, for the reason that this instinct was built up for a condition of existence very different from that which enables the people of this country to indulge themselves today."

The tendency now is to turn from "the guidance of appetite alone" to the guidance of a scientific knowledge of foods and their use in the body supplemented to some extent by appetite. Such guidance makes the adequacy of a given menu a matter of prime importance.

Adequacy of food

The good meal is planned to provide its share of the daily food needs of the group to be served. Dietary studies indicate a general and persistent tendency to make inadequate provision for certain food essentials. There is sometimes a noticeable lack of protein in the diet, accompanied by a deficiency of iron. A surprising number of diets are low in calcium because of the almost complete failure to include milk. Although it is not expected that any meal will contain in exact proportion the foods needed by the body, as the diet for the day should do, effort should be made to keep each meal balanced as nearly as possible. The inclusion of fruit, milk, and whole-grain cereal in the breakfast makes meeting the food needs easier. On the other hand, a breakfast of sausages, griddle cakes, and syrup makes more difficult the planning of the other meals without exceeding the energy requirement. Care should be taken to include foods

rich in the substances likely to be deficient in the diet. The free use of fruits and vegetables, and the frequent use of liver and other glandular organs, aids in meeting the daily requirement for vitamins and minerals. A good menu presents a plan, not only for adequate calories and protein through the wise use of carbohydrate, fat, and protein foods, but also for an optimum amount of the mineral elements and vitamins essential for the well-being of the body.

Staying quality in foods

Plans for the meal should include those foods that give a feeling of satisfaction that lasts until almost time for the next meal. Both the form and the composition of the food influence the staying quality, which is largely dependent upon the rate of digestion of the food consumed and the rapidity of its passage through the digestive tract. A breakfast composed of orange juice and coffee may pass from the stomach in twenty minutes, with the possible early recurrence of hunger and attendant discomfort. Such a meal is said to possess low staying quality. One including fruit, cereal, egg, and toast is rated as having moderate staying quality; whereas one that includes ham and eggs, fried potatoes, and doughnuts is rated as having high staying quality. For the indoor worker, including the traveler, the student, the teacher, the homemaker, or the person whose next meal follows in four hours or less, food having moderate staying value would seem a wise choice. For the out-of-door worker, or for the person who may wait six hours between meals, including of some foods of high staying quality is desirable.

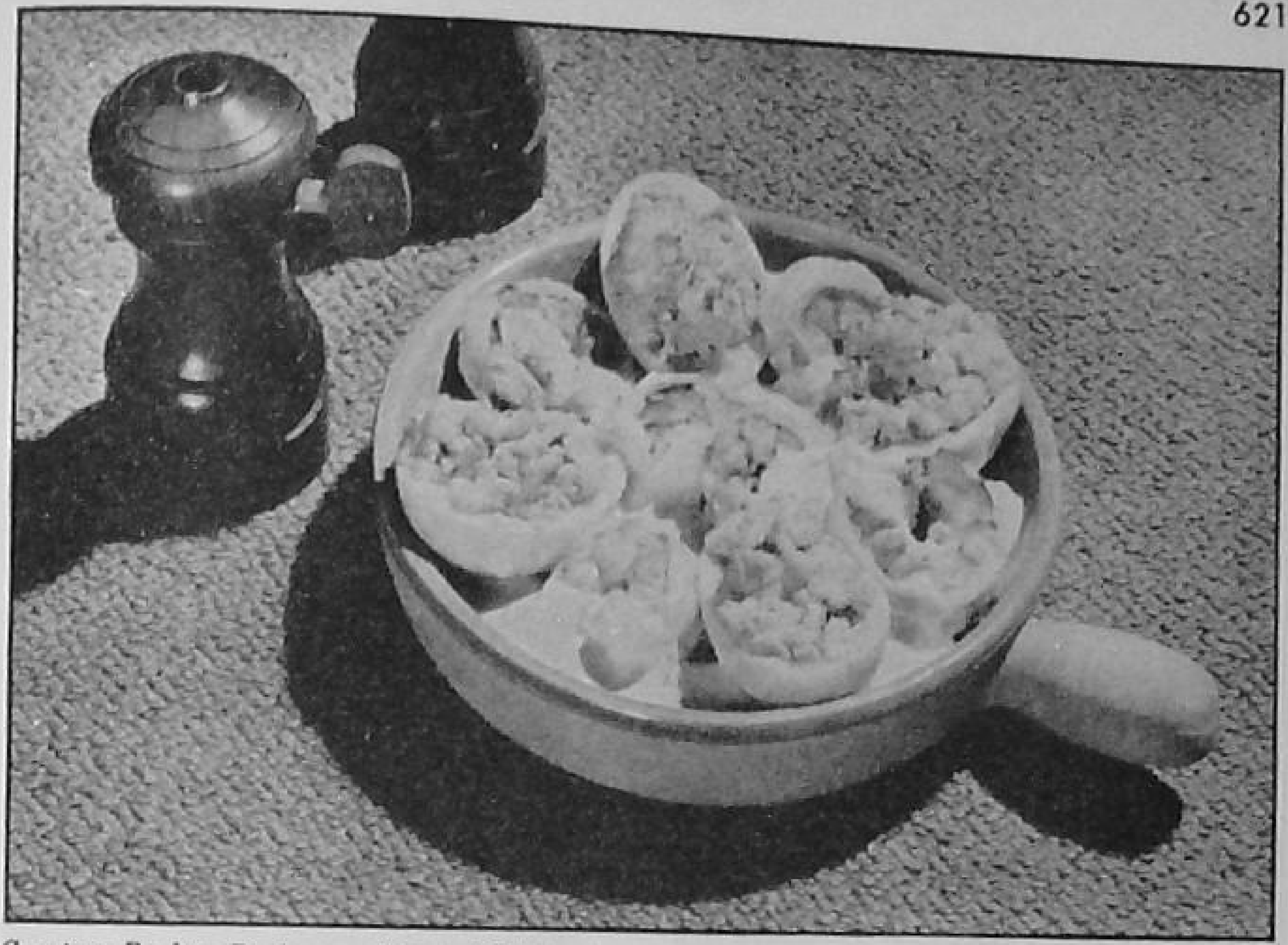
Luncheons or suppers served by American families are usually light to moderate in staying value. A meal of low staying quality comprised of bouillon followed by combination salad, wafers, tea, and a gelatin dessert can be changed to one of high staying quality by the addition of meat and cake.

Suitable combinations

The goal in food combinations has been summarized as follows:

> The ideal meal is a simple one — whether of one or many courses — in which the different types of food are harmoniously represented, but not repeated, and in which food accessories, such as pickles, spices, preserves, and the like, are little needed because the foods themselves are well cooked and each contributes its own characteristic flavor, texture, form, and color to the making of a well-blended whole.[1]

[1] Mary Swartz Rose, *Feeding the Family*, 1929, p. 238. By permission of the Macmillan Company, publishers.



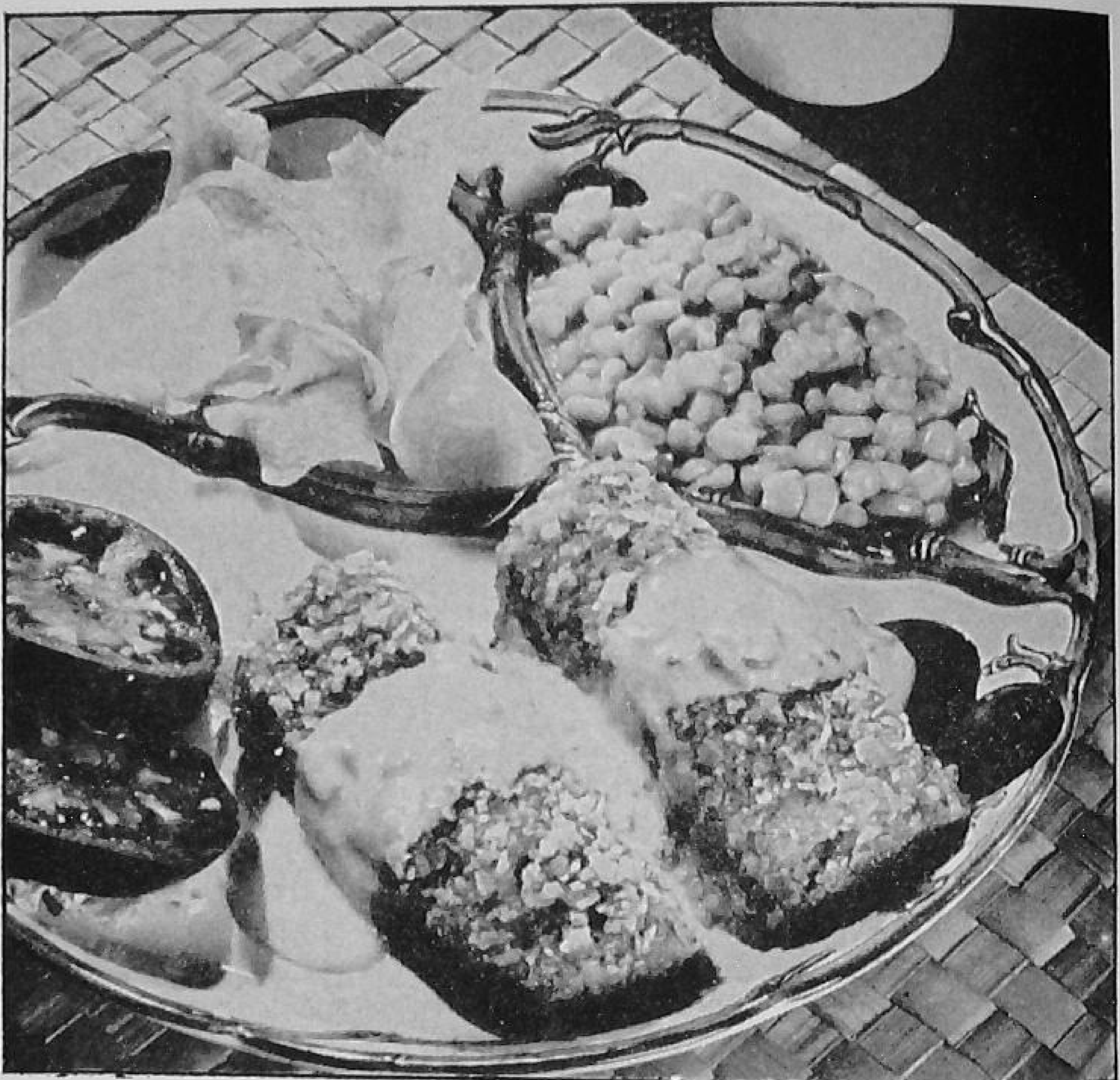
Courtesy Poultry Producers of Central California

Fig. 138

Texture and color contrasts make a pleasing dish.

Interesting contrasts in texture, flavor, and color are important. The attractiveness of the meal depends largely upon these. A plate served with creamed codfish, mashed potatoes, and buttered turnips or one served with buttered beets, sliced tomatoes, and salmon has little appeal. Pleasing contrasts in texture, flavor, and color are lacking in both cases. Not infrequently a meal is served in which all of the foods included seem alike in either the smoothness or the roughness of their texture. Even though other contrasts are provided, the effect of the meal is not pleasing. The various available foods afford material for considerable artistry in food combinations. The French have perhaps made the most of this opportunity for artistic expression which serves as an added accent to a palatable dish.

To a large extent, tradition seems to shape our concept of acceptable food combinations to be included in meals. Baked beans and brown bread; wieners and sauerkraut; roast pork with apple sauce; turkey, dressing, and cranberry sauce; waffles and smoked sausages are well-known examples of food combinations widely accepted as "right and proper" for major parts of meals.



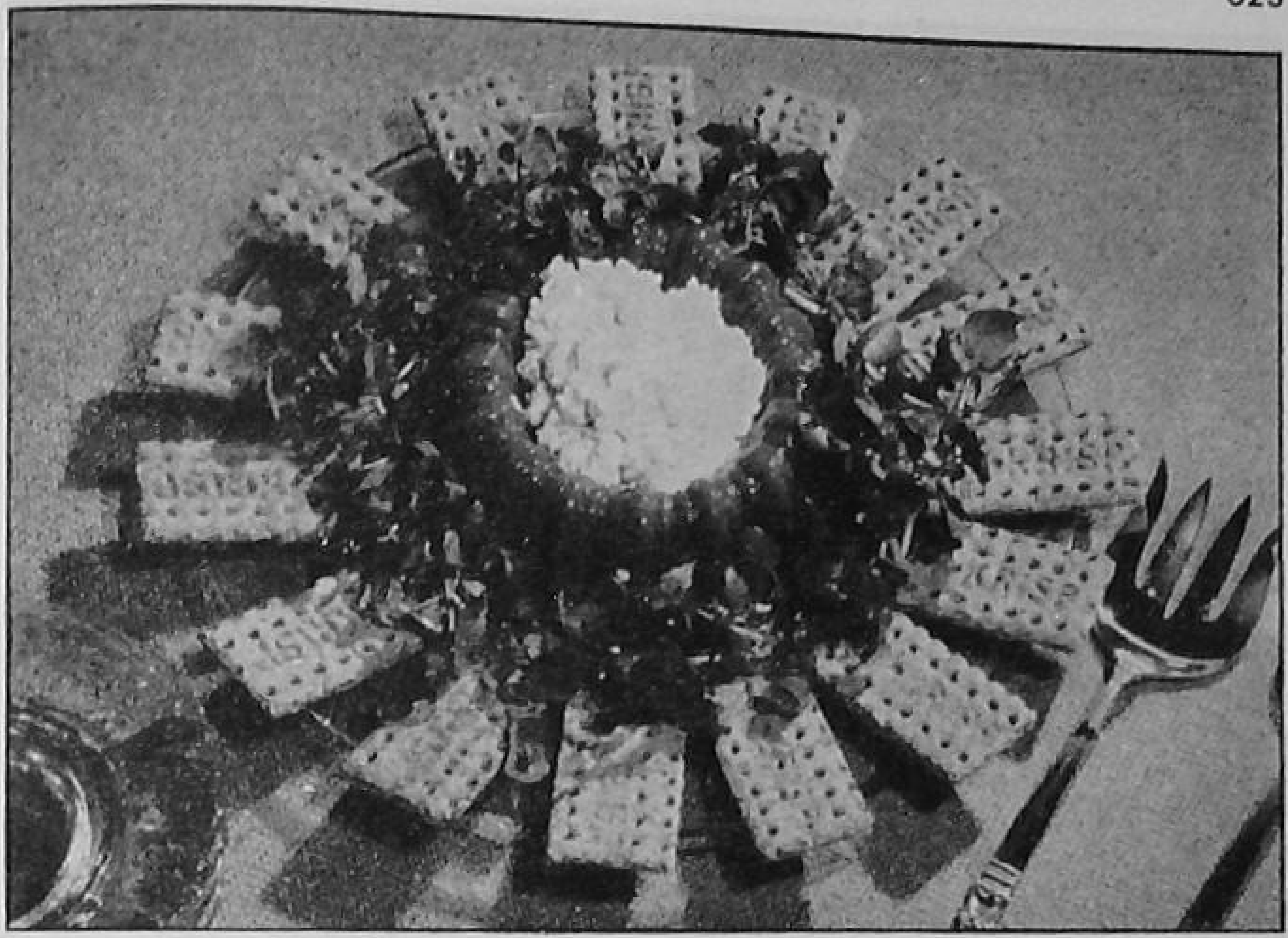
Courtesy of Van Camp Sea Food Company, Inc.

Fig. 139

The divided plate helps make an appealing luncheon.

Seasonability

A good menu should provide food suitable to the season. The effect of weather on enthusiasm, energy, and resistance to disease is generally known. Since the days when Hippocrates admonished his fellow countrymen to make an adjustment in the diet with the coming of summer, the influence of the seasons has been recognized. Lessened work and the lowered muscular tone that almost always accompany the debilitating relaxation of hot weather affect the body needs. In the summer the body needs less food. Fats and fat-rich foods should be limited. Vegetables, particularly the leafy ones, and fruits should predominate in the diet. A seasonable menu for summer provides these foods and protein, simply



Courtesy of Ralston Purina Co.

Fig. 140

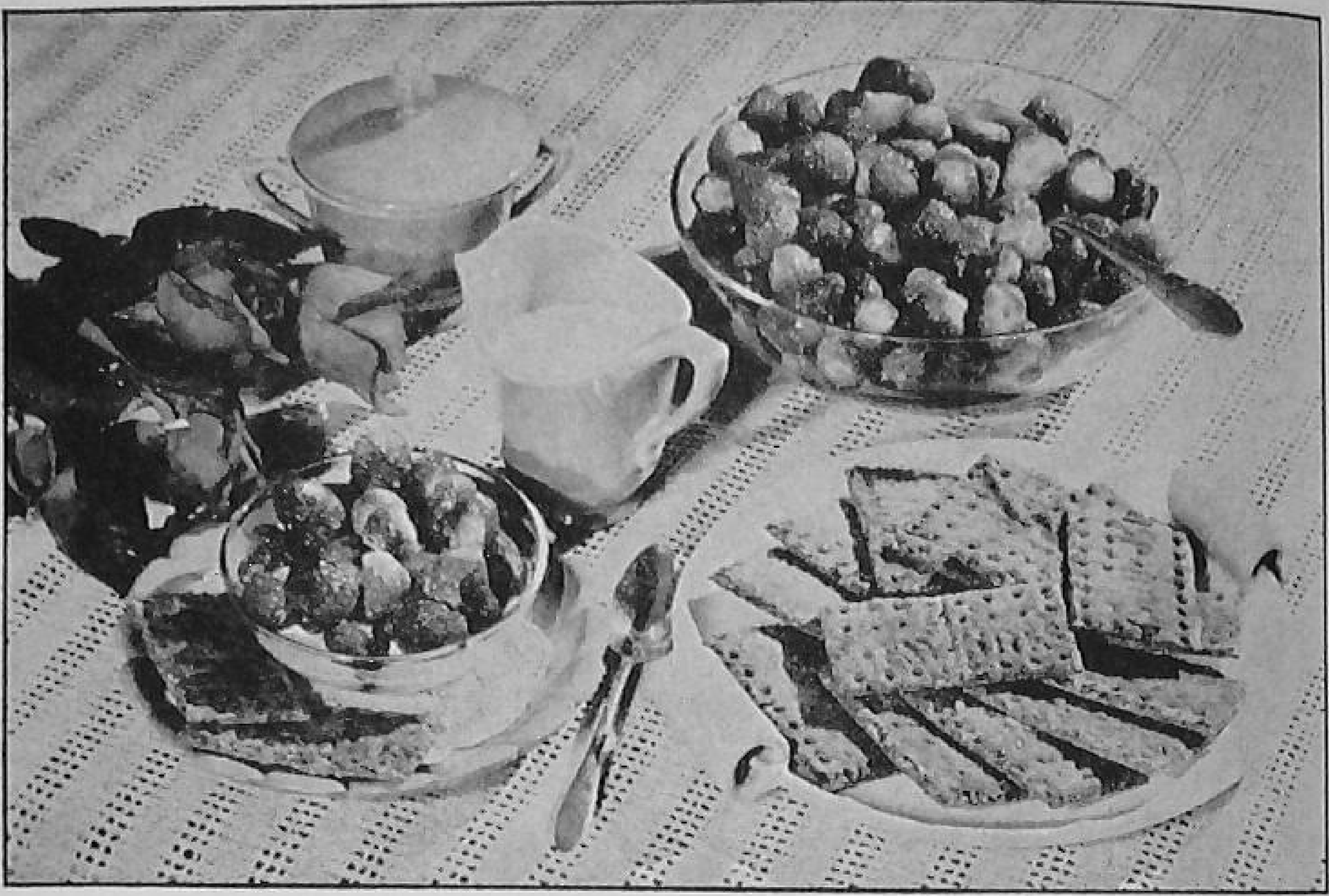
The red of tomato aspic and the green of water cress are accented by the creamy clots of cottage cheese and crisp wafers.

prepared. Hot breads, rich sauces, pastries, and other rich desserts should be avoided.

In the winter season the menu usually contains more heavy dishes. Not only does meat find a place in the main course, but it may appear as a dessert in the form of mince pie. Fats have a large part in such dishes as fried foods, suet puddings, and hard sauces. Sweets too are more frequently used, as also are root vegetables and dried legumes. Since the appetite tends to be greater in the winter and the higher food requirement makes a larger intake desirable, a good menu for the season will have a higher caloric value than a menu for summer. Suitable menus for the different seasons are given in Table 73.

Wise expenditure

A good menu includes foods which can be afforded on the food budget and which offer full value in relation to money expended. There should be a dispersion of cost among the various classes of foods in keeping with that set for the day's diet. There is a range within which the nutritive



Courtesy of Ralston Purina Co.

Fig. 141

Strawberries — a light summer lunch hard to excel. Added cream means added calories.

value of the foods that might be included at a given cost varies but little. Within this range the expenditure for foods on the basis of personal preference may be made advantageously.

Meal patterns

In a country as large as ours, with wide disparity in the daily meal schedules, in the foods produced and consumed locally, and in the family food budgets there are conspicuous differences in the menus served. These cannot be classed as good or bad, except as they are evaluated in terms of the whole situation that their use is planned to meet.

The meals of the day usually include breakfast, luncheon or supper, and dinner; morning coffee and afternoon tea are sometimes added. Through tradition and custom, there has come a mental pattern for each meal as a guide in determining the food to be used. Though these patterns have changed in the past years and are perhaps still changing, they continue to exert a great influence in determining what is included in each meal.

Breakfast

No meal perhaps has become so nearly standardized as breakfast. The

TABLE 73. MENUS SUITABLE FOR SUMMER AND WINTER MONTHS

Summer	
Breakfast Strawberries with Powdered Sugar Shredded Wheat Cream Coffee	**Luncheon** Cheese Soufflé Garnished with Crisp Bacon and Asparagus Tips Whole-Wheat Bread and Lettuce Sandwiches Lemon Sherbet Macaroons Milk
Dinner Chicken à la Casserole Buttered String Beans Sliced Tomato Salad Hard Rolls Butter Fresh Fruit Cup	

Winter	
Breakfast Grapefruit Oatmeal Cream Plain Omelet Toast Jam Coffee	**Luncheon** Creamed Sweetbreads with Toast Points Beet and Lettuce Salad Gingerbread Applesauce Cocoa
Dinner Baked Cured Ham Pineapple Slices Sweet Potatoes Buttered Fresh Spinach Celery Curls Carrot Strips Bread Butter Gooseberry Pie	

fixity in both character and value of the breakfasts chosen by people makes possible the classifying of breakfasts into types. A study of the various types of breakfasts becomes largely a consideration of the measures used by groups to meet their differing food needs. In the case of each type it is fair to assume that its use functions acceptably under certain conditions. The activities and tastes of the person served, the menus for the other meals, the money available for food, the food habits of the group as well as family customs help determine the type of breakfast provided in the diet.

The list of foods commonly used for breakfast is relatively small, and the foods included in it are plain. If combinations of foods are used they are generally simple. Fruit is usually served as the first course of the meal, since it is an appetizer. The food that follows, whether it be cereal

and coffee, or cereal, ham, eggs, and toast, should be determined by the energy needs of the group served. On this basis breakfast menus are classified according to type as very light, light, medium, and heavy, any of which may be good.

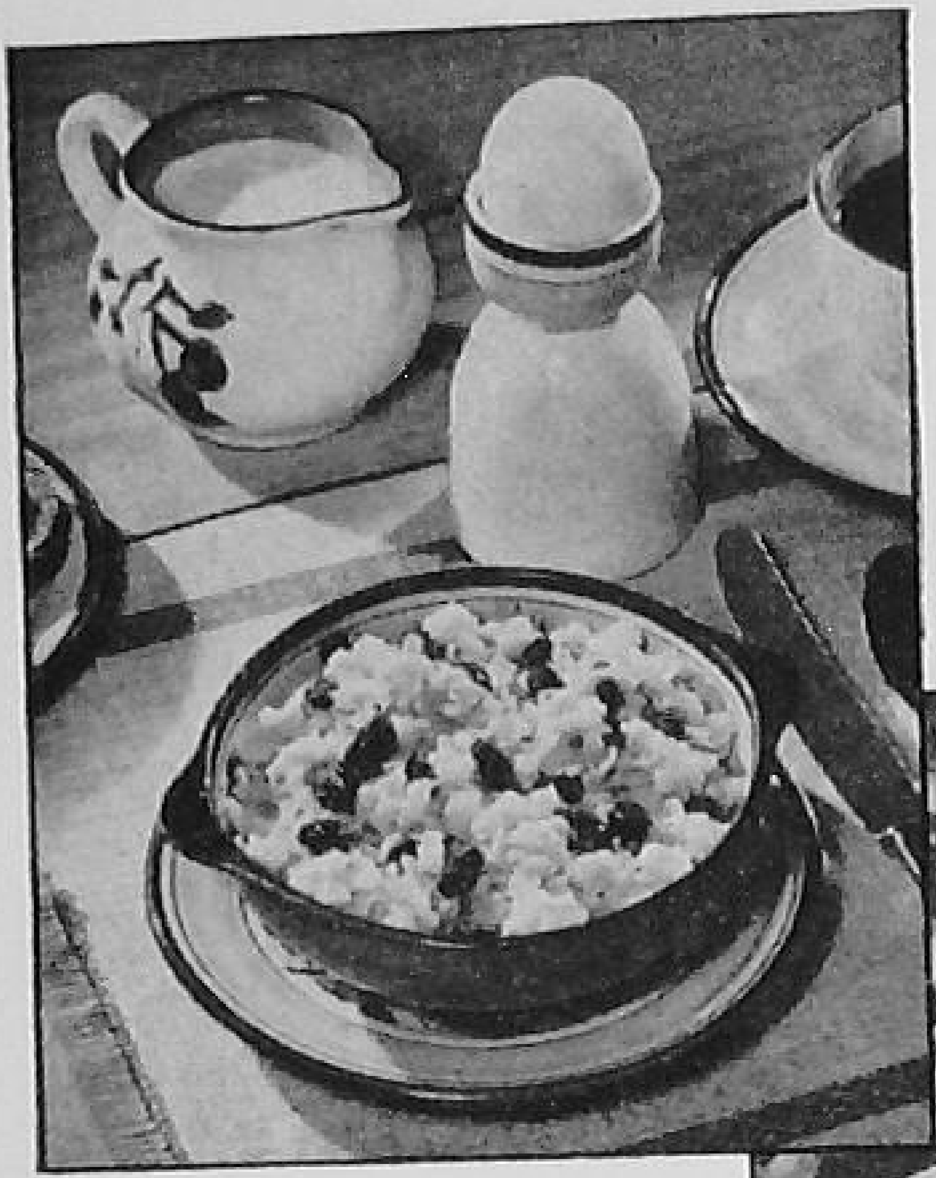


Fig. 142

An appetizing breakfast beginning with cereal and fruit.

Drop biscuits with a juice and egg are featured in this breakfast.

Courtesy of California Dried Fruit Research Institute

TABLE 74. BREAKFAST TYPES

Very Light	Light	Medium	Heavy
Fruit Bread or cereal Beverage	Fruit Bread Cereal Beverage	Fruit Bread Cereal Beverage Main dish Sweet	Fruit Bread Cereal Beverage Main dish Sweet Other hot dish

Luncheon

The force of custom is much less felt in the luncheon or supper plans, and a much wider variety of foods is used. Cream soups, chowders, fruit and vegetable salads, "made dishes" such as macaroni, cheese or meat soufflés, sandwiches, and cocoa are all frequently served. The combinations of food in a good luncheon menu are more complex than those in the breakfast and the problem of obtaining pleasing combinations of flavors, colors, and textures is greater. The amount of food included in the luncheon, like that in the breakfast, depends on the part of the day's food requirement that this meal is to meet.

TABLE 75. LUNCHEON TYPES

Light	Medium	Heavy
Cream of Potato Soup Crackers Carrot Strips Sliced Peaches	Egg Timbales with Cheese Sauce Water Cress Salad Buttered Toast Strips Halves of Grapefruit Milk	Liver Loaf with Spanish Sauce Baked Potatoes Fresh Vegetable Salad Biscuits Butter Ice Cream Spice Cake Fruit Beverage

Dinner

The dinner remains, as it has long been, the chief meal of the day. If it is planned first, decisions can be made more readily in regard to what the breakfast and luncheon should contribute to the day's requirements. Although many dinners include one course of meat, vegetables, and salad and one of dessert, there are advantages in beginning the meal with an additional course which is an appetizer, such as soup, fruit juice or fruit cocktail. As a rule, the meat, whether roast, steak, fowl, or fish, is made the main dish with which the other foods are to be satisfactorily combined. The wider variety of foods used in the dinner complicates the problem of obtaining pleasing contrasts in color, form, and texture. The menu planned for dinner, as well as that of other meals, may be light, medium, or heavy, and if other standards are met, it still will be good. Each of these menus is good if it supplements the other meals of the day so as to make adequate provision for the food needs of those to be served.

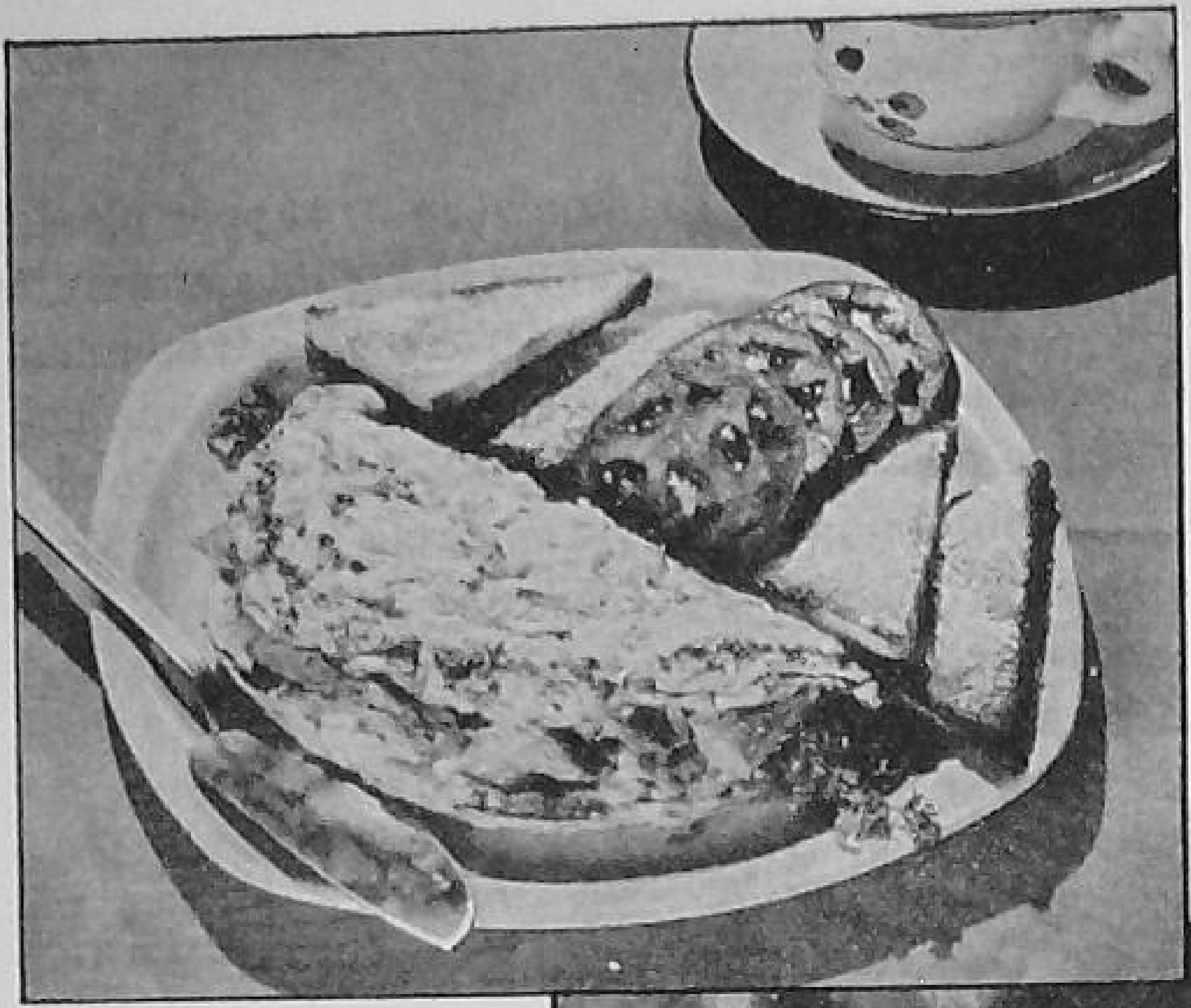
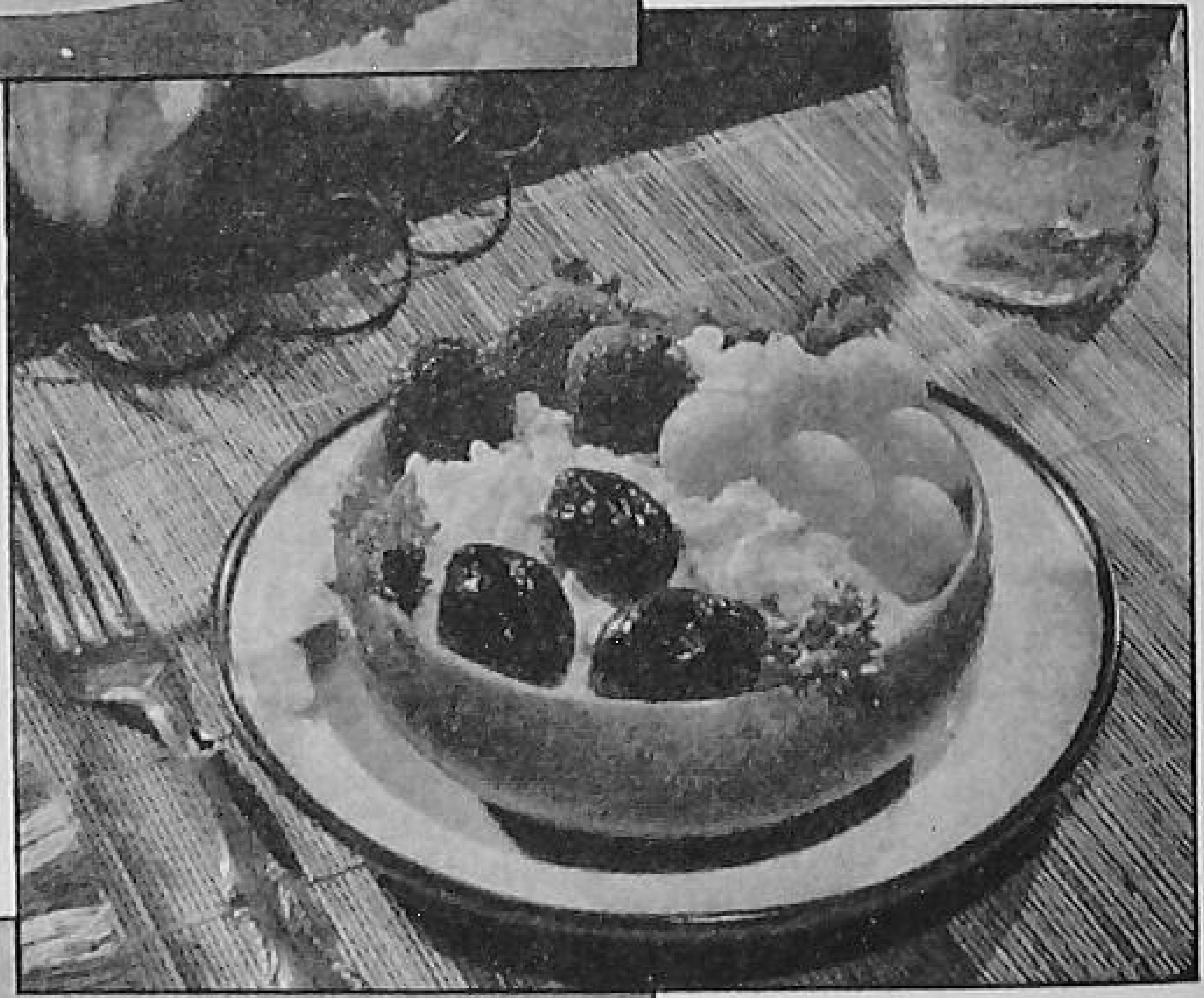


Fig. 143

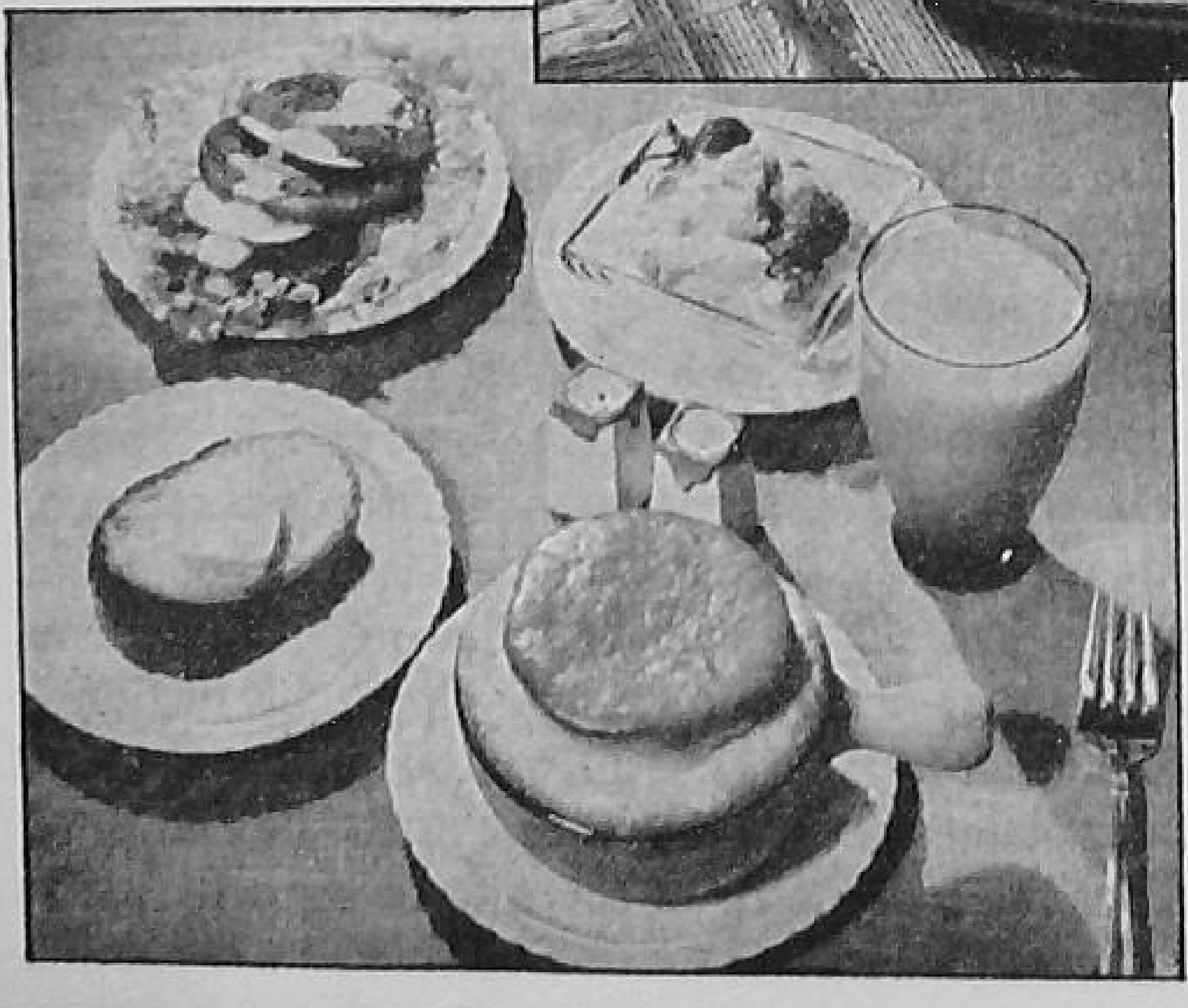
A substantial but yet appealing luncheon.

Courtesy of Van Camp Sea Food Company, Inc.



A tempting lunch for a hot day.

Courtesy of California Dried Fruit Research Institute



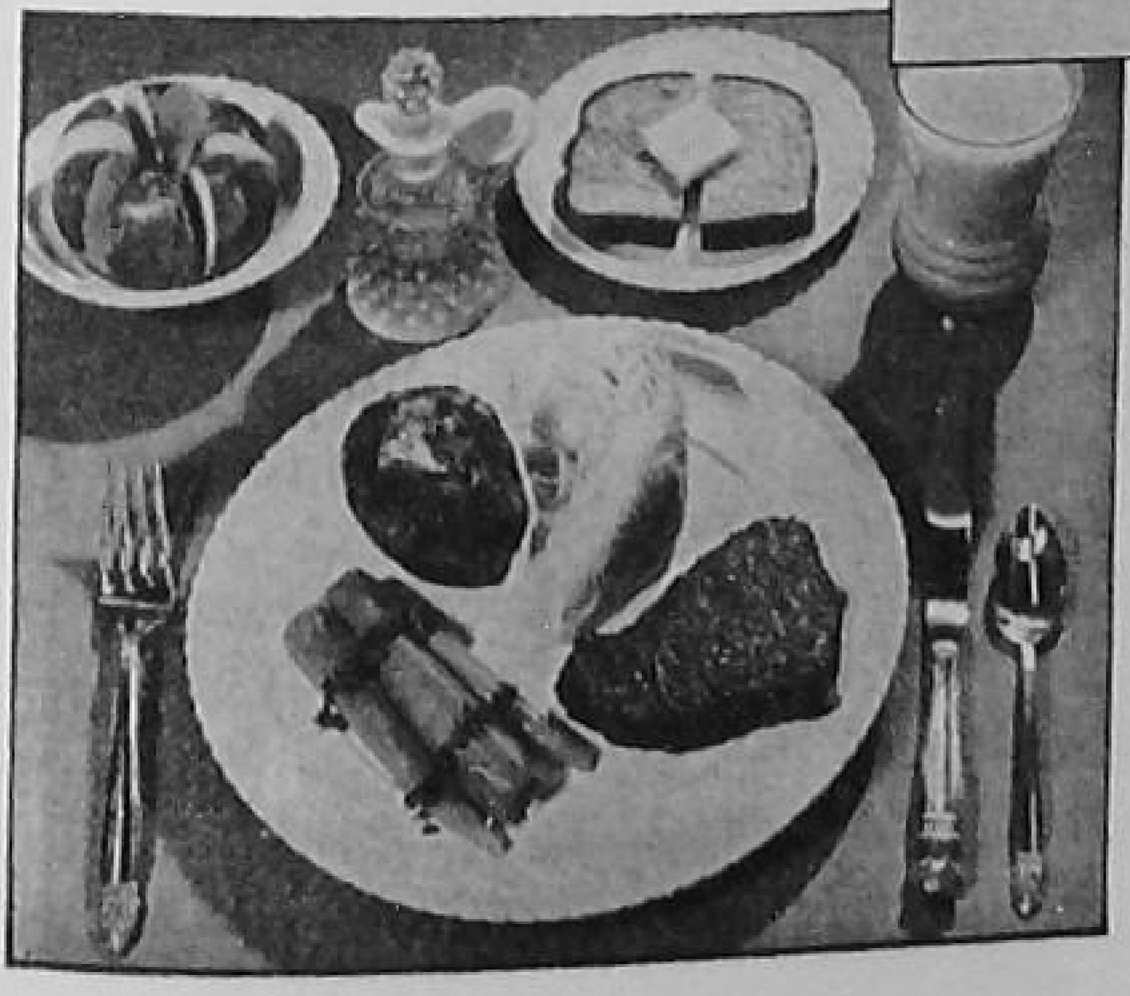
A popular lunch on a cold day.

Courtesy of Wheat Flour Institute

Fig. 144

A substantial dinner at a moderate cost.

A hearty meal with interesting contrasts in texture, color, and form.



A dinner with calories counted and brought under control.

Courtesy of Wheat Flour Institute

TABLE 76. DINNER TYPE

Light	Medium	Heavy
Pot Roast Buttered Fresh Mustard Greens Apricot-Celery-Nut Salad Whole-Wheat Bread Butter Baked Custard with Caramel Sauce	Clear Vegetable Soup Broiled Lamb Chops Browned Potatoes Mixed Vegetable Salad Hard Rolls Butter Fruit Cup Sponge Cake	Tomato Bouillon Baked Heart Dressing Gravy Mashed Potatoes Buttered Broccoli Celery Curls Bread Butter Grapefruit-Orange- Avocado Salad Saltines Apple Pie Cheese Coffee Mints

ACTIVITIES

1. Analyze breakfast and luncheon or supper menus served in three families that you know, for:
   (*a*) Dishes that reflect family custom.
   (*b*) Dishes that reflect family and individual preference.
   (*c*) Dishes whose inclusion is explained by their ease and speed of preparation.
   (*d*) Dishes included specifically to meet nutritional needs.
2. Plan a score card for judging a good menu. Use this to score or rate the menus reported in the first activity.
3. Observe breakfasts eaten by college women and describe the typical breakfast of such a group. How do these measure up to accepted dietary standards? What changes, if any, are needed to make the meal acceptable?
4. List the changes made in your meal patterns since you came to college. Have the changes been for "better or for worse"? Upon what bases have you made these changes?
5. Suggest a menu of the light type for each of the three meals of one day. What changes would you suggest to make them into the medium type? Into the heavy type?
6. Check a list of daily menus which you have been served recently. Note the regularity with which certain foods recur. Indicate how these could be replaced with foods similar in value to give variety and interest.
7. Obtain and score menus from magazines, newspapers, eating places, and other sources. What modifications do they often require to be satisfactory menus?

PROBLEM 3 *How does equipment contribute to meal preparation?*

The time required for the preparation of a meal depends to some extent upon the planning, arrangement, and equipment of the kitchen. Full agreement is lacking among homemakers as to the characteristics of a desirable and efficient kitchen. Then, too, no two families are identical in size, age groups, and activities, all of which influence what is deemed desirable in kitchen space, arrangement, and equipment. The homemaker who has three children under five years of age desires quite a different kitchen set-up than does her career-minded sister whose homemaking activities are sharply restricted to the hours after five. The farm homemaker who must prepare three meals for a family of eight has different needs from those of an urban wife of sixty-five whose family is composed of an aged husband and herself. However, all these homemakers agree on the major importance of being able to do their kitchen work with satisfaction and minimum expenditure of time and energy. An increase of research findings makes possible some aid in planning a kitchen for a successful work center, even under various conditions.

The kitchen

The average kitchen is about 10 by 12 feet, the small one about 8 by 10 feet or even less, and the large one 14 by 12 feet. The size of the kitchen greatly affects its convenience, but no set dimensions that will fit every family can be given. The activities carried on in the kitchen differ markedly. In some households it is the center for the work pertaining to meal preparation and service only; in others it serves as a center for activities varying from the social life of the family to laundering, separating cream from milk, and rendering lard. The rectangular-shaped kitchen is generally recommended and is usually more efficient than one of irregular shape, with many niches and corners.

The floor of the kitchen should be resilient and easy to clean and care for. The walls also should be easy to clean and should add to the cheeriness of the room. Adequate ventilation and lighting should be provided. The whole area should be lighted so that the worker's shadow never falls upon his work. In such work areas as the sink, the range and the work

counter, an illumination value of 40 foot-candles, indirect or semidirect, is desirable. The entire room should have efficient general lighting free from glare and harsh shadows.

Arrangement of equipment

The equipment should be placed so as to contribute to efficient work procedures. Several different plans of arrangement may be used: the U-plan, the L-plan, the corridor or two-wall plan, and the one-wall plan, the latter being used mainly in small apartments. Choice depends largely upon personal preference; an efficient arrangement is possible by any of the plans. The work done in the kitchen centers on the preparation and serving of meals, the clearing away and washing of dishes, and the storage and care of equipment, food, and other supplies. All of the equipment related to one activity should be grouped together and in as convenient a manner as possible. Compact arrangement is always desirable, no matter what the size or type of kitchen. The large farm kitchen in which more than one person works needs just as careful planning as the tiny wall kitchenette in a small apartment.

Courtesy of Caloric Stove Corporation

Fig. 145

A modern range makes meal preparation easy.

The equipment for the preparation and serving of food, and for the clearing away and the washing of dishes can well be arranged into three centers: the *mixing center*, the *cooking center*, and the *cleaning and washing center*. Storage should be provided in each center for all the equipment and supplies commonly used there, and additional storage should be provided elsewhere as needed. The arrangement should be such that each activity can be completed in its own place with the work proceeding in an orderly way. In performing the various tasks in the kitchen, the work generally should proceed from right to left. For example, the steps in preparing soft custard might easily be mixing, cooking, stacking the soiled dishes and utensils, washing the dishes and utensils, and putting them away. An arrangement that permits these steps to pass easily from right to left is desirable.

An exact statement as to what equipment should be located in each center cannot be made because not all people make the same choices, but there are certain items upon which there is agreement. In the mixing center a work counter is necessary, and there should be storage cabinets both above and below. Pans, bowls, cups, spoons, forks, knives, and similar utensils used in the preparation of the food should be located in this center. Certain frequently used foods such as flour, sugar, baking powder, and spices should be kept here also.

The center where the food is cooked is focused about the range. It includes storage space for utensils and dishes needed at the range and possibly a small serving table, wheel tray, or shelf. A kitchen arranged with no utensils for cooking near the range is inefficient.

The cleaning and washing center, sometimes called the sink center, includes the sink, the garbage disposing unit, drainage boards, a dishwasher, if included in the plan, small equipment to be used here, and, sometimes, a work counter. Utensils and supplies used in washing vegetables and fruits and in preparation of uncooked vegetables and fruits should be at hand, as well as those used in dishwashing and other tasks of cleaning.

Although not classed as a work center, the storage spaces are important in the arrangement of the kitchen. Articles to be stored fall into three classes, those in constant use, those for seasonal or occasional use, and those rarely used. Provision should be made in each center for the storage of equipment and supplies which are in frequent use. The cold storage space or the refrigerator should be placed in or near the mixing center. It should also be near the sink. Near or in the cleaning and washing and the mixing centers vegetable storage, supplied with some means of outside ventilation, should be provided and controlled to prevent freezing. The

dish storage should be in the washing center, above the drain board, and within easy reach of and accessible to the dining room. The kitchen of several decades ago had a separate storage unit called the pantry. Some of these still exist, adding to the inconvenience of the house by their presence. All supplies and equipment were kept in the pantry, and frequently the food preparation and dishwashing were done there also. If the range was located on the opposite side of the kitchen, the homemaker walked miles each day in preparing the meals for the family. When it is realized that a thousand meals are prepared each year in a kitchen, consideration of the relation between work centers becomes a matter of importance. These should be located and organized so that in preparing a meal the worker can start at the sink center with washing the foods, work to the mixing and range centers, and then to the dining room without retracing steps. Frequently the sink and mixing centers are combined. This often makes for economy and satisfactory utilization of space and equipment in one center. The planning and arranging of equipment into related work centers on first thought may seem difficult, but it becomes surprisingly easy and interesting to plan for efficiency when the situation is studied.

Every effort should be made to make storage space truly functional. In addition to the placement of articles at the point of first use, functional storage also involves clear visibility and easy and quick accessibility. Means devised to attain this end include vertical files for flat and shallow utensils and dishes; horizontal and slanting files for trays, covers, and the like; pull-out panels and shelves; bins for the storage of vegetables and fruits and revolving shelves of the "lazy Susan" design for corners.

Orderly arrangement and availability of minor equipment are also important. Nothing hinders efficient meal preparation more than to be forced to spend a large amount of time looking for misplaced utensils. Pieces of equipment that are frequently used together should be kept near each other. Some plan of arrangement should be made. Some workers prefer all the knives together, and all the spoons and cups. Others prefer the bread knife near the bread box, the pancake turner near the griddle, and the measuring cup near the sugar and the flour. Personal preference is so important that it seems best for the worker to plan her own kitchen arrangement and to use its resources consistently.

Working surface heights

A proper working level is advantageous. Correct posture is essential to health, and no worker can have good posture if the surface level at which she regularly works is incorrect. Working surfaces that are too low may

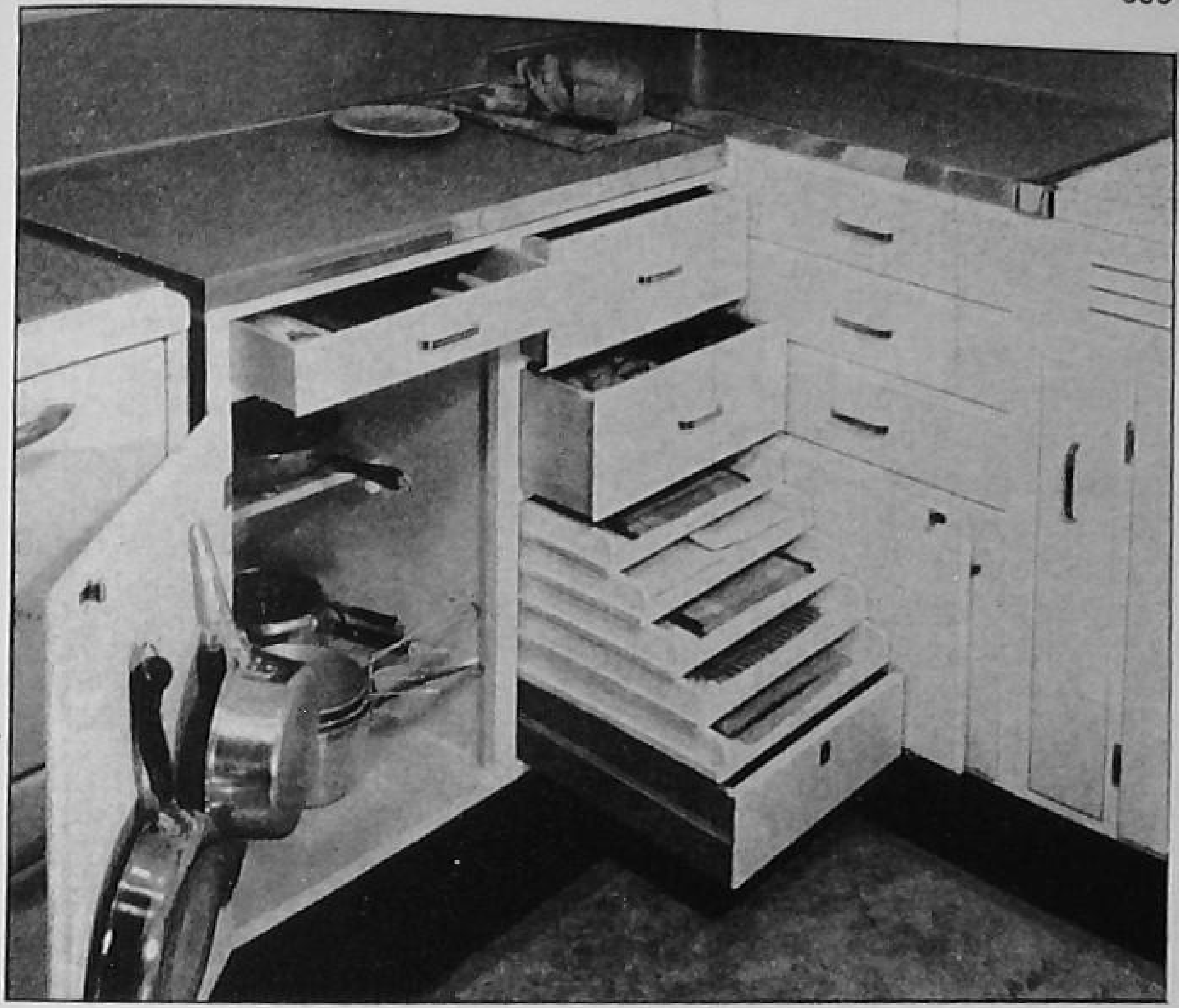


Fig. 146

Sliding shelves, shallow drawers, and use of hooks permit ready access to table linens and kitchen equipment.

cause round shoulders, a "rainbow" curve in the spine, and unnatural relaxation of the abdominal muscles and crowding of the internal organs. Working surfaces that are too high may throw the shoulders out of line, and strain the muscles of the shoulders and abdomen. Incorrect working surfaces induce fatigue. The correct working surface is that height at which the individual can work comfortably, with the back and shoulders straight and the arms in a natural position. Correct working surface heights vary with the height of the individual, the length of the forearm, and the distance from the waist to the floor.

The following test may be applied to determine the correct working surface heights:

1. *Tables, ranges, sinks, and work-counters*

   There is some controversy as to what constitutes the correct height of a working surface. In general, it is agreed that the height of tables, work-counters, and ranges is correct when one can stand erect with shoulders

back and place the palms of the hands flat on the surface. This means that in working on these surfaces the arms will be raised to a slight angle, which is the normal position for working. Another way to determine the correct height of the working surface is to stand in a natural position with the arms hanging straight at the sides. The distance from the floor to the wrist bone is a satisfactory height for the working surface. A much favored plan is to make the work-counters next to the sink even with the drain board or top edge of the sink and the counter surface of the mixing center the same height as the floor of the sink. The kitchen is provided with work-counters of two different heights, thus adding to the convenience and efficiency of the worker in various jobs.

2. *Sinks*

   The floor of the sink should be the same height as the mixing counter. The sink drain board will be five or six inches higher, according to the depth of the sink. If the floor of a sink is too low, either because the sink is too deep or because it has not been located properly, a small wooden slat frame may be used on the bottom to raise the dishpans while washing dishes.

3. *Stools and chairs*

   As much work as is possible should be done sitting. When sitting at the table on a stool one should be in the same position as when standing. A distance of five to nine inches should be allowed for knee space between the stool and the table. When sitting in a chair while working, the working surface height should be twenty-five inches. This is made possible by pull boards built in the various work centers.

Heiner suggests after allocation is made to the center of first use, items should be placed there within the work curve limits or the easy reach of the average woman (5 feet, 3 inches to 5 feet, 5 inches in height) in terms of frequency of use and by weight. Suggested widths and depths for storage are:

TABLE 77. DIMENSIONS OF STORAGE SPACES *

	Width	Depth
Utensil storage at range	16 inches	14 and 16 inches
Utensil storage at sink	24 and 28 inches	16 and 18 inches
China and glassware storage	20, 24, and 36 inches	6, 8, and 12 inches (with 3-inch door storage)
Packaged supplies	24 and 31 inches	4 and 6 inches (with 2- and 4-inch door storage)

* Mary Koll Heiner, "Functional Kitchen Storage in Terms of Body Economy," Journal of Home Economics, Vol. 39, No. 2 (Feb. 1947), pp. 70–72.

The following optimum heights for working surfaces have also been suggested:

TABLE 78. SUGGESTED WORKING SURFACE HEIGHTS

Height of Worker	Height of Working Surface
5′	32″
5′ 2″	32″
5′ 3″	32″
5′ 4″	33″
5′ 5″	33″
5′ 6″	33″
5′ 7″	33½″
5′ 8″	34½″
5′ 9″	35½″

Care should be taken when a house is being built or remodeled so that all working surfaces are made the correct height for those who will use them. Working surfaces already installed can often be raised or lowered satisfactorily, so that it is not always necessary to work at an incorrect level. The work table may be raised by putting the legs in blocks, or lowered by cutting off the legs. The sink may be raised by adding a piece of pipe to the plumbing fixtures underneath. The range may be raised by putting the legs in blocks. Certain models of ranges are being made with the working surface 35½ and 36 inches in height. Some homemakers have been able to adjust the height of certain of these ranges by having the legs removed and a cabinet built of the desired height upon which the range will rest. The importance of correct heights for working surfaces should not be overlooked. Attempts should be made to obtain satisfactory adjustments in some manner.

Selection of equipment

With the stores full of equipment of all kinds and varieties, some of it attractive and useful, some merely attractive, and little if any labeled to show whether it meets specifications for durability or performance, it is small wonder that the homemaker sometimes feels at a loss in making her selection. Frequently, she buys not only a poor quality but also more than she needs or uses. Not long since, a man was heard to say, "This year we spent all our savings for pots and pans, many of which are not earning even one third of the interest on the investment, judging from the use that we have made of them."

Before an equipment list can be made satisfactorily, the food habits

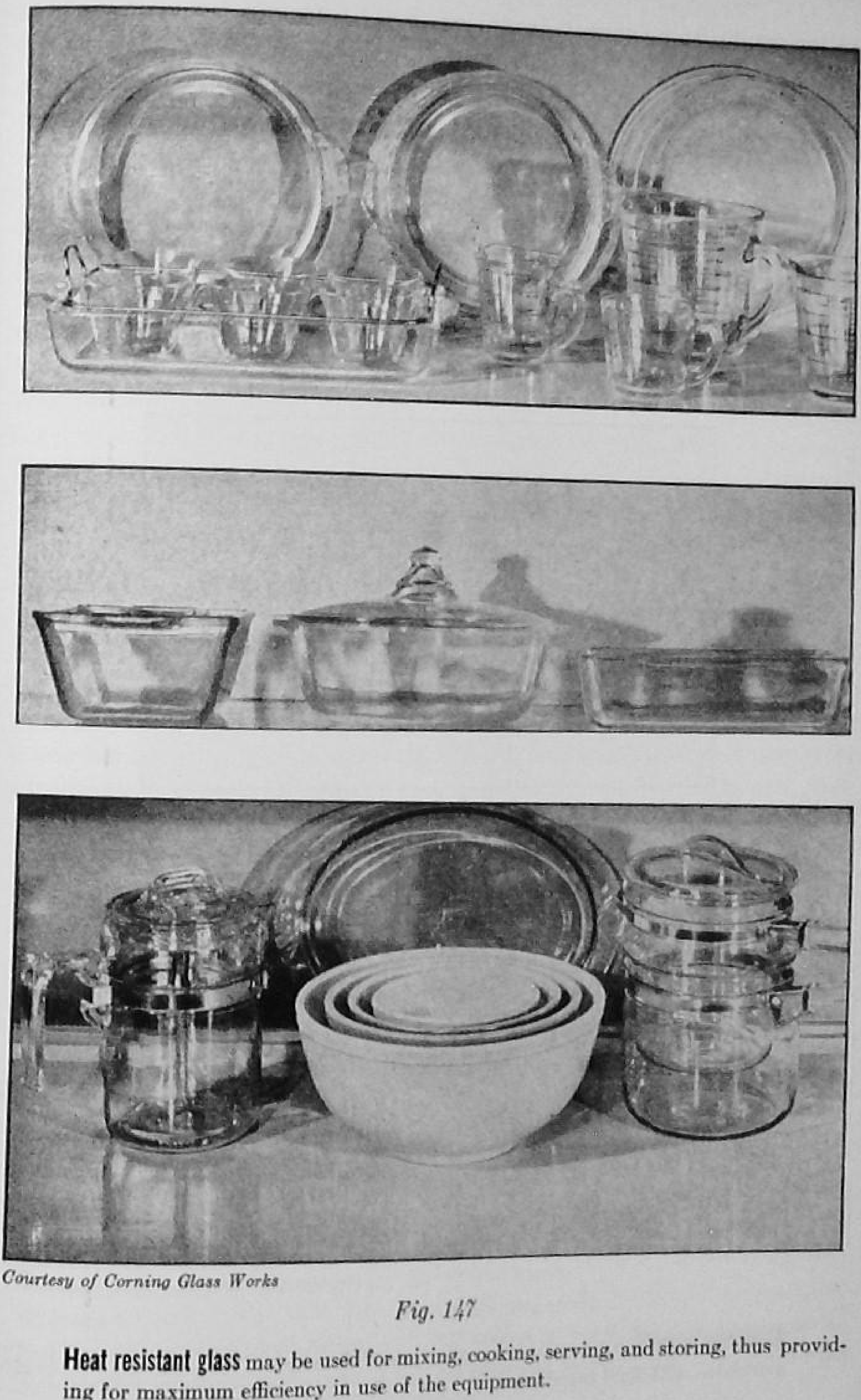
of the family to be served should be studied. Then only articles which are needed and will be used should be purchased. Such questions as the following should be considered. Is the family permanently located? Is the number or size of the group relatively constant? Is the family just being established, or has it reached the stage where one by one its members are leaving and the size is constantly being reduced? Is the family a temporary one made up of adults who are living together for a limited time? In one situation, the best plan may be to purchase a minimum of good equipment and gradually add to it and build up the supply; in another, the best plan may be to buy the inexpensive and less durable equipment. If a group frequently entertains a number of guests, it may be necessary to have more pieces and larger ones. The family that prepares all of the food in the home needs different equipment from the family that buys much food already prepared. In choosing equipment, the amount of money available should be one of the determining factors.

The range

The range receives first thought among the pieces of equipment for the kitchen. Meal preparation is largely dependent upon the range, and a satisfactory one is essential. Modern designs for ranges stress effective insulation, efficient operation, and easy cleaning. Some models present burners arranged in a row so that there will be no need to reach over hot burners or hot utensils. Other features include insets or wells made in the top of the range to hold a pressure cooker or a deep-fat fryer. In some of the new kitchens, ovens and broilers are provided as separate units with glass doors and are so placed that stooping is unnecessary in their use.

Ranges are available in which various fuels may be burned to heat the range surface and the oven. Today coal, wood, kerosene, and gasoline have been largely replaced as kitchen fuels by gas (natural, manufactured, and bottled) and electricity, all of which may be described as convenient, safe, clean, easy to operate, and as reaching cooking temperatures quickly. Electric rates for various sections of the country sometimes vary so much that the operating cost of an electric range is enough higher than that of a gas one to influence, if not determine, the choice of the range on the basis of the fuel to be used.

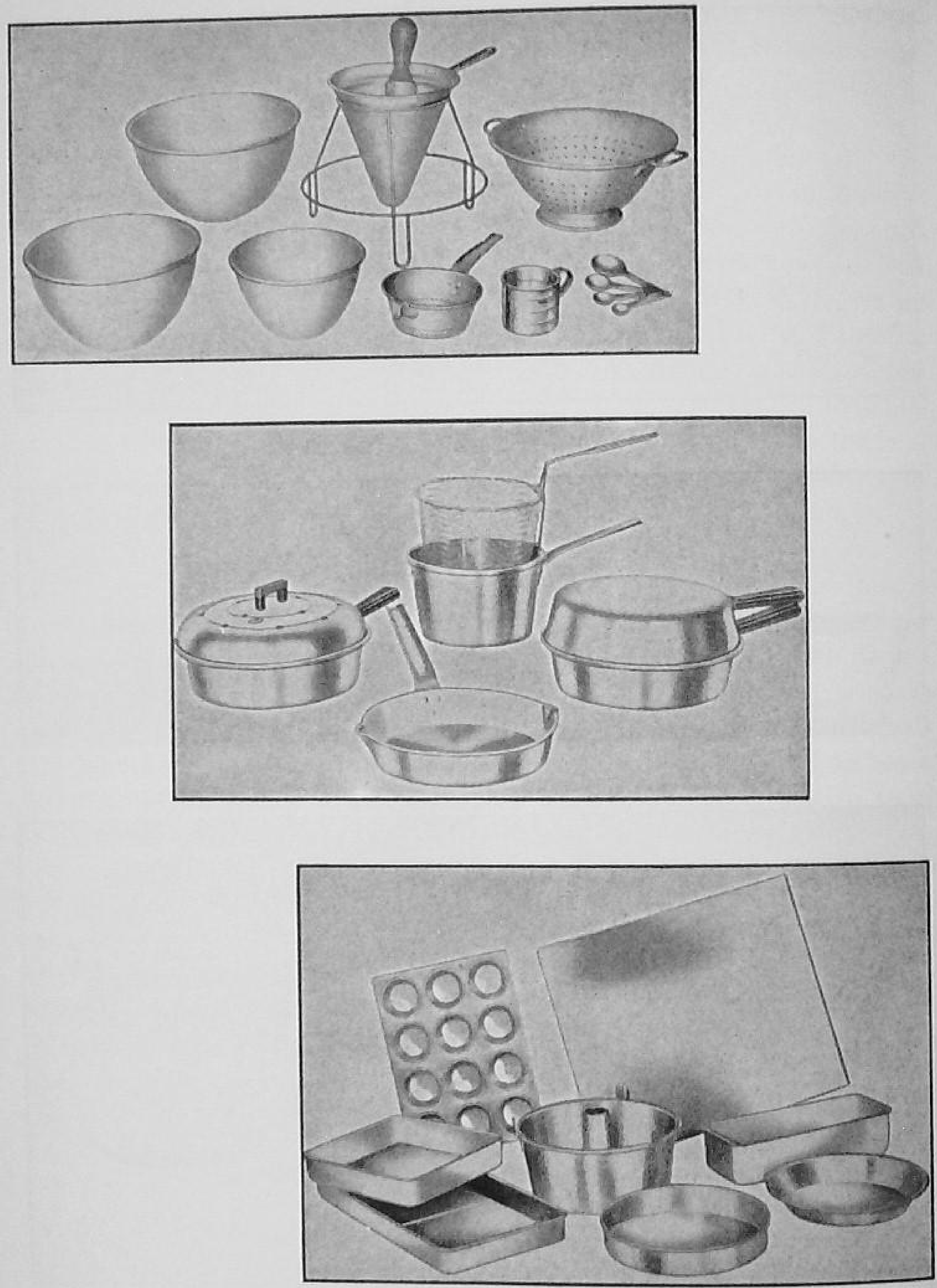
Regardless of the type of range or of the kind of fuel used, one should endeavor to purchase the best possible range with the money available. Each type has a wide price variance. Either an inexpensive, moderately expensive, or expensive range can be purchased. Cost of operating, con-



Courtesy of Corning Glass Works

Fig. 147

Heat resistant glass may be used for mixing, cooking, serving, and storing, thus providing for maximum efficiency in use of the equipment.



Courtesy of Aluminum Cooking Utensil Co.

Fig. 148

Aluminum utensils are available for all types of cooking and for most other processes associated with food preparation.

venience, and necessary care should be considered. Construction, materials used, durability, size of top and oven, insulation of the oven, and efficiency of the heating elements all affect the desirability of a given range.

The sink

Sinks are commonly porcelain on iron though monel metal and stainless steel ones are available. Models of these various materials may be had in either single or double bowls. Splash backs are desirable, and there should be a draining surface or work surface of at least eighteen inches on each side. Among recent improvements are knee or foot control faucets and garbage disposing units. The sink unit should be a minimum of eighteen inches in width.

The refrigerator

The refrigerator should be purchased by specifications, covering its performance, durability, ease of cleaning and permanence of finish. It should have the manufacturer's guarantee of specified performance for one year. The label should also indicate the amount of shelf room provided. Consideration should also be given to sanitation and ease of cleaning. In the choice of a refrigerator, consideration should be given to the initial investment, the cost of operation, and the character of service available locally. Inspection will show whether specific and adequate provision has been made for storing frozen foods, meats, milk, and fresh fruits and vegetables. It will also show details in the design intended to simplify daily and weekly care.

Small equipment

The types of small equipment found in stores are numerous and various. Many of these are of little value to the homemaker. Small equipment should be carefully selected to avoid an undue supply of useless, inefficient, or seldom-used pieces. The following list has been suggested for a small or average-sized family.

Indispensable Pieces

1 dish pan, 12-quart
1 dish drainer
1 soap dish
1 shallow, uncovered, roasting pan to fit oven
2 baking sheets (aluminum or tin)
2 sets muffin pans

Indispensable Pieces

2 pie pans
3 layer cake pans
1 square cake pan, 8- or 9-inch
2 loaf pans
2 cooling racks
1 casserole with lid (earthenware or fireproof glass)

Indispensable Pieces

1 roaster
1 double boiler
1 perforated or slotted long-handled spoon
1 wooden spoon or paddle
1 ladle
1 potato masher
1 can opener
1 opener for screw-top jars
1 opener for pry-off covers
1 butcher knife
2 paring knives
2 spatulas
2 case knives
1 bread knife, 8-inch blade
1 cook's knife
1 cake turner
1 meat fork
2 case forks
1 kitchen tongs
2 vegetable brushes
2 rubber scrapers (for mixer and dishes)
1 coffee percolator or other type of coffee maker
1 teakettle (if needed)
1 teapot
4 saucepans with covers (1-quart, 2-quart, 3-quart, 4-quart)
2 utility pans (assorted sizes)
1 pastry board or piece of duck cloth
1 rolling pin
1 flour sifter
1 biscuit cutter
1 oven thermometer (if needed)
4 mixing bowls (1-pint, 1-quart, 2-quart, 4-quart)
1 puree sieve

Indispensable Pieces

1 colander
3 measures (1-cup, 1-pint, 1-quart)
1 set measures (¼-cup, ⅓-cup, ½-cup, 1-cup)
1 set measuring spoons
2 tablespoons
2 teaspoons
1 vegetable grater and shredder set
1 fruit reamer
1 rotary egg beater
1 strainer to fit top of cup
1 wire whisk or whip
1 large iron skillet and cover
1 8-inch iron skillet
1 pot scraper
12 tea towels
4 dish cloths
1 garbage pail with cover (if there is no automatic disposing unit)
1 sink strainer
1 dustpan and brush
1 towel bar
1 fly swatter
1 match box, if needed

Desirable Pieces to Include

6 custard cups
1 toaster
1 carving set
1 apple corer
1 griddle
1 preserving kettle
1 food chopper, crank type
1 funnel
1 kitchen shears
1 pastry blender

Materials for equipment

The durability, efficiency in heat conductivity, suitability to the purpose intended, and ease of cleaning and handling of any piece of equipment depend to a marked degree upon the materials used. There is no

one material that is suitable for all equipment, so choice should be made upon the basis of the individual piece. Aluminum, porcelain, enamelware, tin, heat-resistant glass, iron, Russian iron, steel, stainless steel, wood, and earthenware are the principal materials of which small equipment is made. Various pieces are made in each material. Some materials are better for certain uses than others, but frequently two or more materials are equally satisfactory for a particular piece.

Interesting and attractive utensils are now being made of stainless steel, chromium, and copper. They are expensive and the demand for them is therefore limited. The durability of stainless steel equipment and the ease with which it can be cared for has led to its general use in institutional kitchens, and its wide acceptance in home kitchens as well. Knowing the characteristics of the materials commonly used in utensils aids in their selection and use.

Aluminum is widely used in the manufacture of utensils. It is light in weight, attractive, and durable. It is second only to copper as a conductor of heat. It never rusts and is not affected by ordinary household acids. It is discolored by alkalies; hence, soaking aluminum utensils in soapy water will lead to their discoloration.

Cast iron is durable and relatively inexpensive. It distributes heat evenly and holds heat well. Heavy and porous, it has a tendency to rust unless properly handled.

Earthenware or pottery conducts heat evenly and slowly and holds it for a relatively long time. Its glazed surface is impervious to alkalies and acids alike. However, it is subject to damage by sudden changes in temperature. Most pottery utensils are made for use in oven cookery and for serving oven-cooked food. Only a few makes are expected to withstand exposure to direct flame.

Copper is the best conductor of heat of all metals used in the manufacture of kitchen utensils. Copper cooking utensils are commonly lined with tin to prevent corrosion; if the lining wears thin, the utensil must be replated as corroded copper utensils should not be used.

Glass absorbs heat and holds it well. There are two types of glass utensils, flameware and oven glassware. The latter should never be used for top-of-the-range cooking. Glass utensils should be protected from direct exposure to heat and sudden changes of temperature. Food should be placed in a glass utensil before heating it; the outside of the utensil should be dry before it is placed over direct heat. Medium heat is also recommended for this type of cooking. A glass utensil should never be allowed to boil dry.

Porcelain enamelware is usually made of glass fused to steel. It is nonporous, resists acids and alkalies, and does not discolor foods. The titanium enamels used on better grade utensils made in recent years have greatly improved resistance to acids, impact, abrasion, and to sudden changes in temperature; such utensils may be taken from the refrigerator and placed on the range without fear of damage. There are types of porcelain enamelware which can be used for frying, although porcelain enameled utensils are most frequently used for surface cooking operations which require water and for storage.

A new type of enamelware, imported from Europe, is glass fused on cast iron. It is chip resistant, does not heat spot and is available in lovely bright colors. Heavy in weight and extremely durable, it is very expensive.

Older enamelware utensils or those not made of these new high-quality materials should be carefully protected against sudden changes of temperature; they need even more careful protection against sharp blows than do the newer ones, and should not be used for frying. No porcelain enameled utensils should be allowed to boil dry.

Stainless steel cooking utensils and cutlery have been widely accepted as being just what the name implies. Such is not actually and uniformly the case. There are wide variations in the composition and finish of so-called stainless steel products which affect their stain resistance in daily performance. There are twelve metal-defacing acid foods in common use in kitchens which tend to spot stainless steel utensils on prolonged exposure. These are cream, vinegar, mustard, milk, mayonnaise, coffee, tea, butter, vanilla, tomato juice, lemon juice, and beet juice. Some stainless-steel utensils resist fully; others spot more or less badly, some becoming permanently tarnished. Heat may also stain or darken these materials, often permanently. Besides a tendency towards spotting and heat staining, some of these products lose their mirror-like finish in use. However, generally, they evidence no damage from warping, buckling, or denting.

Efficiency of equipment

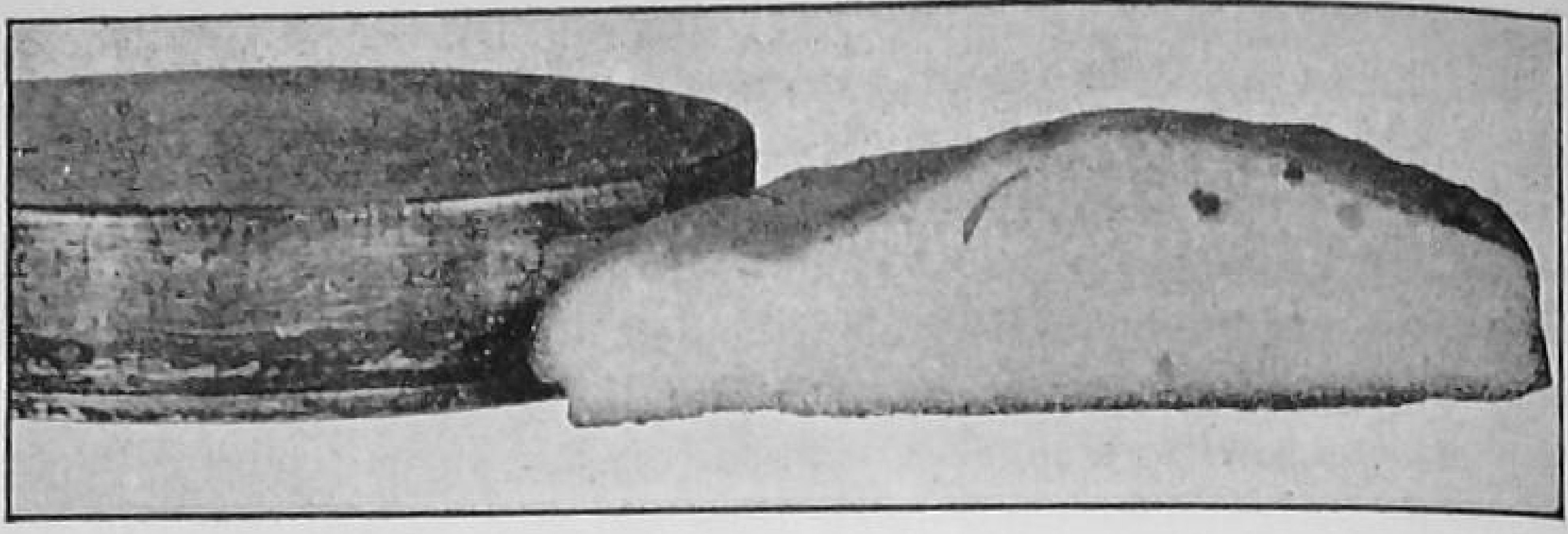
The efficiency of equipment may not always be easy to determine. Because research in this field is new, the standardization and labeling of articles to meet specifications of performance and durability are scarcely begun. When buying equipment, one should obtain all the information possible concerning its efficiency and wearing qualities. Rotary egg beaters that do not turn, waffle irons that stick, knives that do not stay sharp-

ened, or toasters that are always out of repair demonstrate low efficiency. A pan should cover the heating unit well and should sit flat upon it. If the bottom is rough or black, it will heat more rapidly than if it is smooth or polished. Utensils with straight sides are more efficient than those with flaring or bulging sides. The dimensions of the oven and of the top of the stove should be known, and pans should be chosen to fit.

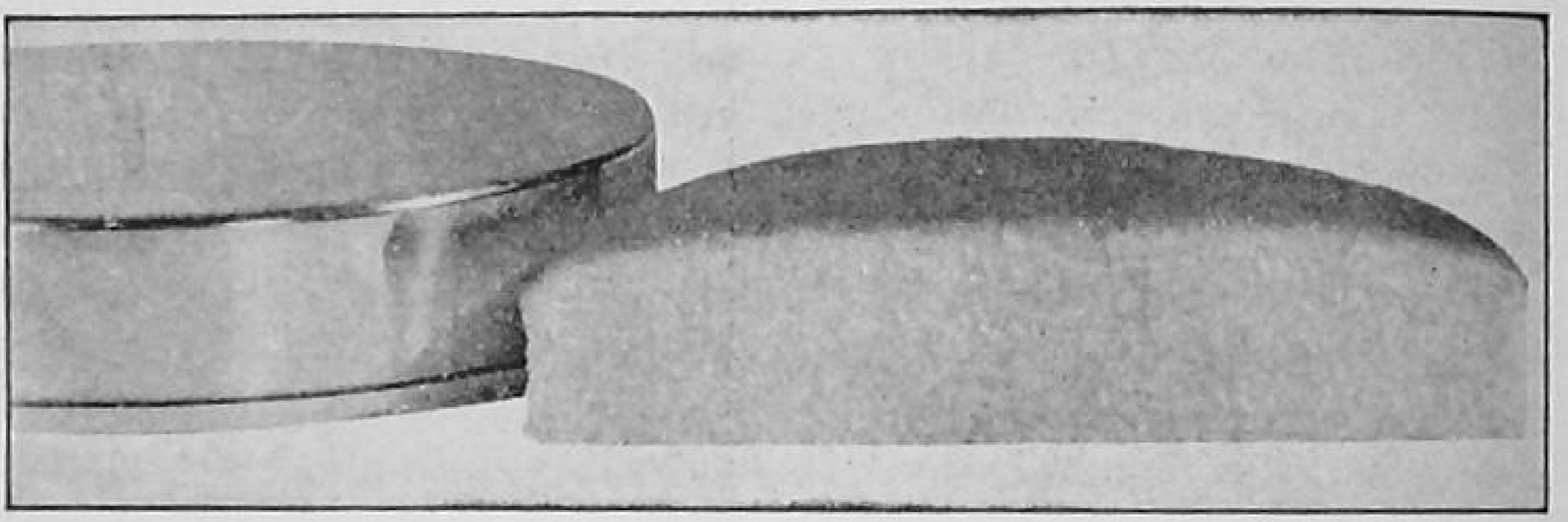
The choice of the pan is important, as the pan rather than the oven may be responsible when cakes, biscuits, or other baked products do not brown properly. Two cakes made from the same recipe, baked in the same oven for the same length of time and at the same temperature, may brown quite differently if cooked in different pans. In one, the cake may come out a nice even medium brown; in another it may be too pale; and in still another, too dark or unevenly browned. In general, enamelware baking pans give the deepest brown. Glass ranks next in rapid browning, especially in an electric oven which has a high degree of radiant heat. Enamelware and glass both absorb radiant heat well. In enamelware, however, the browning often is mottled because this material does not distribute heat evenly. In aluminum, tin and stainless steel baking pans, browning is less rapid and usually more even, unless the material is very dark or thin and warped so that the heat is uneven.

The shape of the pan also influences browning. Cake baked in a square pan, especially if the pan is of enamelware, is likely to become too brown at the corners. Browning is more even in round pans. Biscuits and cookies brown best on a flat sheet or on the bottom of an inverted pan. In a deep, high-sided pan these products often come out too pale because the high sides "shade" them from the radiant heat. Pan size also counts in browning. If the pan is too large for the recipe, a cake or bread mixture may be spread too thin and may become too brown.

The durability of a knife and the satisfaction derived in its use depend largely on the kind of steel employed in its construction, the provision made for the steel of the blade being continued to the end of the handle (full length), the grind of the blade, and the details of handle construction. The material of the blade should be high-carbon, stain-resistant steel. Except for heavy-duty knives, for which the sabre grind is desirable, a concave grind of the blade is generally preferred. The shape of the handle should be such as to fit the hand, permitting a firm, slip-proof grip of the knife without undue pressure and tension. The handles should be made of durable material that will not chip or crack, warp or splinter. The number of rivets used to attach the handle to the blade is an indication of quality. Three rivets of nickel, silver, or other rust-resistant material,



A tarnished baking pan exacts its own penalty.



Courtesy of the S.O.S. Company

Fig. 149

A bright baking pan brings its own reward.

flush with both sides of the handle, make a desirable "join" of handle and blade. The shapes of the various knives included in the kitchen equipment list should be such as will provide for efficient paring, chopping, dicing, trimming, and related work.

The purpose of a rotary egg beater is to facilitate the flow of air into the batter or other mixture being beaten. This action is accelerated as the number of cutting edges in the beater is increased from four to eight and as the beating proceeds in one direction only. The angle of the blades influences the ease with which the beater whips the batter and also the quantity of air enfolded. The turn of the blades should be in the same direction. Other details of the design should be considered with care to determine how each will add to or subtract from the efficiency of the tool. Details of construction may be equally revealing. A handle pinched in its place in the metal frame without screw or stay or an egg-shaped wooden handle forced down over the metal by a push, will soon be worked

loose. When it falls out, the beater will have to be discarded. The blades should be made of a firm-gauge material, well fabricated; all moving parts should be precision made, so fitted as to work well together, and all parts should be so combined as to assure durability in use.

The electric beater is an article of such great usefulness in various food preparation procedures as to merit special consideration. The principles applied in its design are the same as those used on the rotary beater except the force employed is electricity. By its use much of the chance and guesswork is taken out of the preparation of batters, doughs, frostings, and fondants, just to mention a few of its uses. The choice of a stationary beater to which the food is brought, or the lighter one that may be taken to the stove and used there, seems an individual matter. Here, as with other pieces of equipment, a beater that is characterized by sturdy, durable construction and one that is easy to clean is desirable.

Pressure saucepans, although they are not listed as essential equipment, rank tenth on the list of wanted items, according to a recent survey, and lead such other wanted articles as electric ranges, home freezing cabinets, and dishwashers. They present numerous advantages worthy of consideration. Their use saves time and fuel, since they greatly reduce the cooking time for many foods, and that of succulent vegetables, such as peas, to even one minute or less. When a pressure saucepan is used, the shortness of the suggested cooking period must be respected, or overcooking will result.

Before any additional equipment is bought, that on hand should be considered. Sometimes a more intelligent use of available equipment is needed rather than an increased amount.

ACTIVITIES

1. Draw to scale on graph paper the kitchen in which you prepare meals. Mark the paths traveled in preparing some one meal. To what extent do the lines cross and recross? How many work centers are there? Are any combined? What improvements in arrangement would you suggest?
2. Decide how this kitchen could be made a more convenient workshop.
3. Determine the most satisfactory working surface height for you. What surfaces, of the kitchen studied if any, need to be raised?
4. Make a list of small equipment that you consider essential for a given family. Compare your list with the lists of other class members. How do all the lists compare with the suggested list on pages 641–642?
5. Study the small equipment in your home kitchen or one similar to yours. Note possible points of difficulty in care, and the range in capacity of kettles, and

also the number of utensils with close-fitting lids. Also determine the number of pieces seldom used.

6. List the chief large pieces of equipment in your home. Estimate the frequency with which they are used. Consider the prices of these articles. Does their use justify the investment? Report your reasons for the decision reached.
7. Choose some one utensil, for example, a double boiler, saucepan, skillet, egg beater, or other piece. Determine the variation in price in the local stores and, also in probable durability for several models of this article. Upon what is the variation based?

PROBLEM 4 *How do table appointments contribute to meals?*

Every meal, no matter how simple or elaborate or what the style of service, requires some table appointments. These include table covering and napkins, often known as table linen; dinnerware, sometimes called chinaware; glassware; flatware and holloware; and some type of holders for table decorations. Because much of the enjoyment of a meal depends upon table appointments, their choice is important, and consideration should be given them.

Table linen

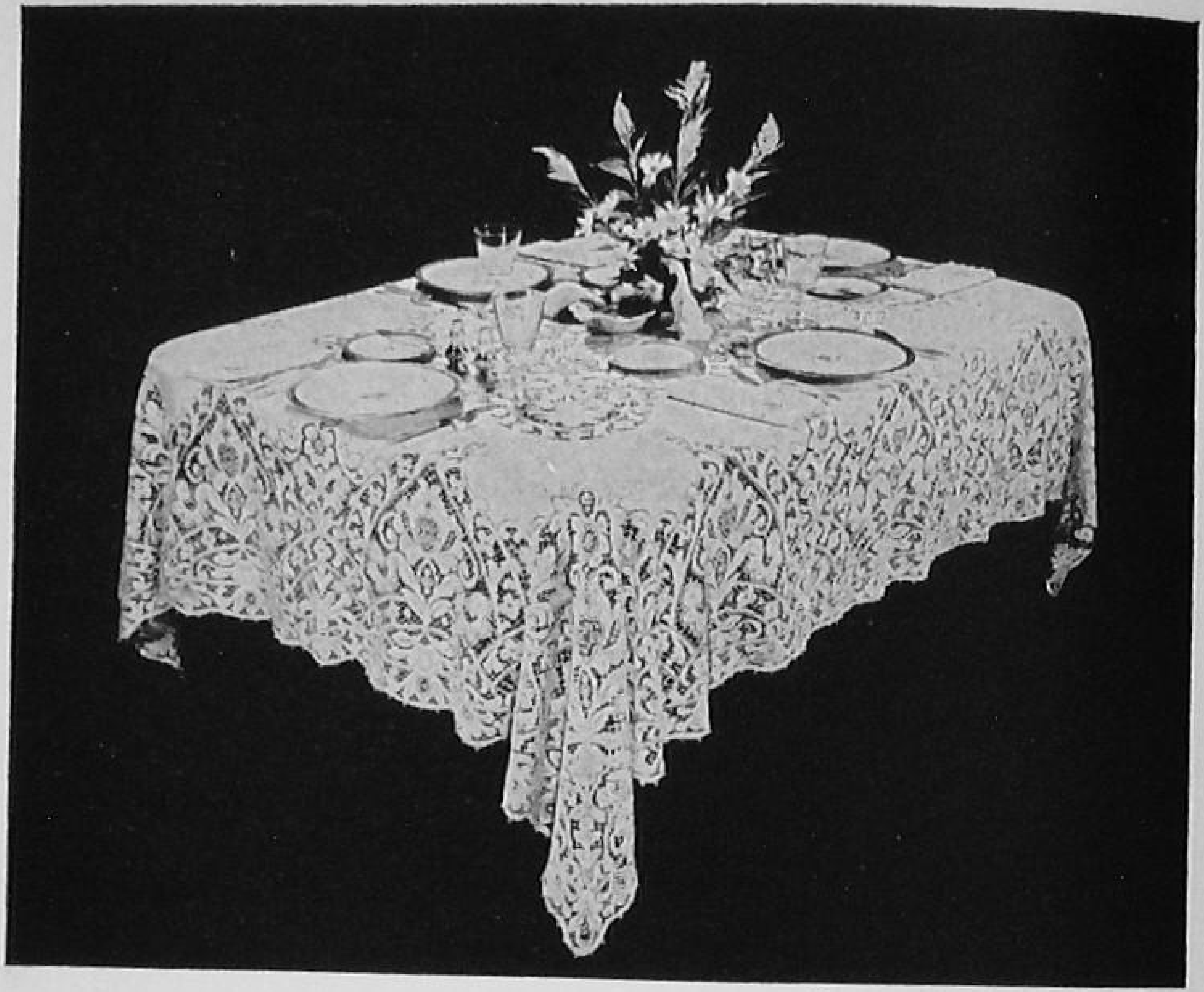
The term "table linen" has somewhat changed in meaning. Once it referred to tablecloths and napkins made wholly from the linen fiber. Although the term still includes these same articles, they may be linen, cotton, rayon or other synthetic fibers, cotton and linen, or cotton and a synthetic fiber. Table linen made its appearance comparatively early in the cultural development of man. The tablecloth was early called a board cloth. For a long period, due to the lack of dishes and utensils, food was placed directly on the table. Of course, only the nobility and wealthy families had tablecloths. Servants and commoners all ate from uncovered boards. Since the food was eaten with the hands until the introduction of forks in the seventeenth century, napkins were needed to wipe off the hands during the meal and at its close. Under such conditions many

tablecloths and napkins were needed; and the value of having an ample supply of table linen was early appreciated.

Even though table linens are now made from many types of fibers, those made from linen are still favorites. The material for tablecloths may be plain in weave or figured, as in damask. The damask may be single or double, the latter being the better quality and more expensive. Linen damasks are made in certain standard designs, many of which, such as poppy, rose, chrysanthemum, shamrock, and satin band, have been handed down through the centuries. Many of these traditional designs have been copied in the damasks made of other fibers. The patterns on plain weave cotton and linen crash are commonly made by printing floral or conventional designs in one or more colors on them. Sometimes the color effects are subtle; sometimes they are bold. Sometimes the colors prove transient; sometimes they are satisfyingly fast. To the taste of many, their use is a pleasing way of introducing color and gaiety into the table setting for informal meals.

Tablecloths may be purchased by the yard or in patterns, both hemmed and unhemmed and are made in a variety of widths to fit tables of various sizes. A tablecloth should hang over the sides from six to nine inches and over the ends from ten to sixteen inches. A good material for a tablecloth, regardless of the fiber or fibers from which it is made, is heavy in weight and free from excess starch, and its threads are smooth and close together. Lace tablecloths are now widely used. They are generally made of cotton or linen thread and in patterns of various sizes. They vary in price from the inexpensive to the costly. A lace cloth makes an especially beautiful covering for a tea table. The tablecloth, unless lace, requires the use of a silence cloth under it to deaden the noise from dishes, to protect the table, and to add to its general appearance. The silence cloth is made of cotton felt, double-faced cotton, or quilted table padding. It usually has a slight drop on the sides and ends, thus providing a smooth edge around the table. Special asbestos table pads, purchased to fit the table, are sometimes used. However, these are more expensive than the silence cloth and give a much harsher surface for table setting.

Tablecloths are being replaced to a considerable degree by smaller cloths often known as luncheon and breakfast cloths, table runners, and place mats. These are made of such materials as linen, lace, rayon and other synthetic fabrics, muslin, gingham, prints, and plastic — all in various colors and designs. They add much color and charm to the table and on the whole are inexpensive. They are also much more easily laundered and cared for. Though their use is largely confined to breakfast



Courtesy of Quaker Lace Company

Fig. 150

Lace tablecloths are popular and practical.

and luncheon, they do frequently appear at the more informal dinners. Common sizes for luncheon cloths are 50 by 50 inches, 54 by 54 inches, 50 by 60 inches, and 54 by 60 inches. Common sizes for breakfast cloths are 36 by 30 inches, 45 by 45 inches, and 45 by 54 inches. Table runners are usually 18 by 36 inches, and place mats 12 by 18 or 14 by 20 inches. Round mats or doilies should be large enough to extend at least one and a half inches beyond the plate.

The use of place mats on the bare table for all meals is increasing in homes everywhere. The attractive table settings that may be arranged as well as the work saved the homemaker are doubtless important influences in the matter.

Napkins are made of the same materials as are tablecloths, luncheon and breakfast cloths, table runners, and place mats made of a fabric. They may match the cloth or may be of entirely different material or design.

The size of napkins varies from 12 to 27 inches square. The small napkins, 12 to 18 inches square, are the luncheon and breakfast size and are used with the luncheon and breakfast cloths, place mats, and runners. Large napkins are used for dinner. Twenty-two inches is the most common size for dinner napkins though many people still prefer the 24- and 27-inch sizes. The standards for selecting tablecloths also hold for napkins. A looseweave material, heavily filled with starch, makes a napkin of extremely poor wearing quality.

Courtesy of Watertown Manufacturing Company

Fig. 151

An attractive place mat adds to the charm of the table.

In selecting table linen, one should always consider the use and treatment that it will be given as well as the money available for its purchase and the time and energy involved in its care. High-grade and beautiful linen damask, though attractive, is expensive and requires special care in laundering; a good grade of cotton damask, an inexpensive breakfast cloth or set of plastic place mats may be, under existing circumstances, a much wiser purchase.

Before the use of plates

In medieval England, trenchers,[1] formed from flat round loaves of bread made from a poor quality of flour, served as plates. (Figure 132.) These were baked at least four days before they were used. The loaf was then sliced through the center, separating the top from the bottom. The crusts were removed and the bread cut in smooth segments or trenchers. These were symmetrically piled in stacks of four upon the cloth at each place laid at the table. Food, such as meat stew, was taken from the dish with the thumb and two fingers of the right hand and placed on the trenchers, and the knife was held with the left hand. The pieces of meat held on the trencher with the hand were cut with the knife. The gravy then ran into the bread, which was afterwards eaten. Thus those who like bread and gravy are following a long and honorable tradition. Today a bit of toast served under creamed chicken or asparagus is an unconscious reflection of the practice of trencher days. The use of trenchers was, however, limited to those who had means sufficient to maintain a large household staff, including bakers to make these loaves, and trencher men, whose business it was to cut and shape the baked loaves properly. The middle classes, and those lower, had not even trenchers as substitutes for plates. For them the problem was solved by carving in the deep table top a shallow bowl-shaped depression for each place. In some cases the depressions so formed were connected with a draining trench, carefully carved along the side of the table to facilitate cleaning. In time, bowls or plates, carved from wood and used on a flat-topped table, replaced these trough-like facilities. The separate shaped bowl or plate of wood or "tree" marked the first step toward our present elaborate use of individual plates. During Queen Elizabeth I's reign wooden platters or plates were in common use, even for state occasions, among all except the very wealthy who might afford silver or pewter dishes.

[1] Sir D'Arcy Power, *The Foundations of Medical History*, pp. 63–66.

Dinnerware

Even in 1750, we are told, the possession of plates and cups of any material whatever in sufficient quantity for each person to be served was a privilege of the upper middle classes and the nobility. About this time Josiah Wedgwood turned from the making of butter crocks to the manufacture of dinner sets for the nobility, and plates and mugs for those whose limited means prohibited larger purchases. From his pottery at Burslem, queensware, so named because he was designated as potter to the Queen, was shipped to all parts of England and to the English colonies in America. The interest in "queensware" by all people from the nobility to the laborer, first pronounced "a passing fancy" by Wedgwood's critics, proved to be permanent. Upon it has developed one of today's great industries which provides even the simple homes of our country with attractive and inexpensive dinnerware.

In general there are four types of dinnerware: porcelain and china, semiporcelain, earthenware, and plastic. The differences in the first three types are due chiefly to the type and mixture of clay used in making them and the methods of firing. Porcelain and china are the best and most expensive types of dinnerware. They are a hard, vitrified, translucent pottery, hard to chip and resistant to blows. Porcelain is usually a blue-white color, and china a cream color. Porcelain originally was made in China and later in Europe also. China was produced as a result of attempts in Europe to reproduce Chinese porcelains. It was during this time that bone china was developed in England. This is a beautiful translucent pottery with a slight green tint, made by adding as much as 50 to 60 per cent of powdered bone to the clay and then firing twice. Today the terms porcelain and china are used interchangeably because the products are so nearly the same. Examples of this type of dinnerware are Dresden, Haviland, Minton, Spode, Wedgwood, Irish Belleek, Lenox, Syracuse, and Castleton.

Semiporcelain is a soft-bodied ware with porcelain covering and glaze. It is semivitreous, opaque, glazed, and fine in texture, and it usually has a white or ivory-colored body. It is less resistant to blows than porcelain or china and may be cracked or chipped fairly easily. Much of the moderately priced dinnerware is of this type, and many lovely designs and patterns are available. Some of the English potteries that make porcelain and china also make semiporcelain. Thus the names Wedgwood, Royal Doulton, and Spode appear on semiporcelain ware as well as porcelain. Some of the well-known semiporcelain wares carry the name of

Homer Laughlin, Johnson Brothers, or Edwin M. Knowles. American manufacturers mark semiporcelain wares "semiporcelain" or "semivitreous"; English mark theirs "fine earthenware." Because there are a wide variety of grades of this ware, some authorities do not include semiporcelain as a type, preferring to call the superior grades porcelain and the inferior, earthenware.

Fig. 152

The pleasing floral pattern in this dinnerware is characterized by dignity and reserve. Obviously, the beauty of the meal in which it is used will be greatly enhanced.

Earthenware is the least expensive and the most widely used of the dinnerwares made from clay. Made from softer clay than the other types, it is vitreous, opaque, and heavy but not brittle. It chips easily, cracks, crazes, and absorbs grease and stains when chipped and cracked. Though most dinnerware has a hard glaze, earthenware may be glazed or unglazed. Unless specially colored, earthenware is either white or soft cream in color. Pottery, a popular dinnerware of this type, has a wide variety of colors and designs. In England, most of the famous potteries make earthenware as well as the expensive porcelains and china and the less expensive semiporcelain. In the United States, earthenware generally is made by manufacturers that make only this product. In some European countries earthenware is known as peasant ware.

Dinnerware, whether porcelain, semiporcelain, or earthenware, may be plain white, ivory, cream, tinted, or deeply colored. It may be decorated with a tiny gold line, with a delicate design, or with a heavy all-over pattern. Color decoration may be underglaze, that is, applied before the glaze is applied, or it may be overglaze, that is, applied after the ware is glazed. Underglaze decorations are the more durable of the two. How-

ever, in the better qualities of overglaze, the ware being decorated has been fired sufficiently to make the decoration durable and permanent under normal use. Some dinnerware has a pattern molded in, thus giving a rough surface. A conventional design that is not too heavy and large is usually a better choice than a realistic one. The design should be one that goes well with the other table appointments and the furnishings of the dining place.

Courtesy of Watertown Manufacturing Company

Fig. 153

Modern plastic dinnerware is viewed with favor by many families.

Improvements have been made in plastic dinnerware since the early experimental products of this ware dismayed their owners by softening and warping under the application of hot water. The improvement in plastic dinnerware is largely attributable to the current large production of dishes from the plastic, melamine-formaldehyde. Products from this plastic are favorably known for resistance to chipping, cracking, and breaking, and for workmanship, construction, and finish. They are reported to have a greater resistance to breaking, chipping, and cracking than is found in ceramic ware. However, melamine dinnerware has certain limitations. Lacking the hard glaze of china, these plastic dishes are more readily scratched and marred. Once the glossy surface is scratched or marred, the sheen cannot be restored and lack of luster, most readily apparent on dark, solid colors, may lead to the discard of the piece. Plastic dishes may not be preheated in the oven without the probability that serious damage may result. In some cases, cups and bowls have been so designed as to make stacking both awkward and hazardous.

Dinnerware is commonly sold in sets and is usually less expensive when purchased this way than when purchased in selected pieces. Sets are made up in services for one, two, four, six, eight, or twelve people, and

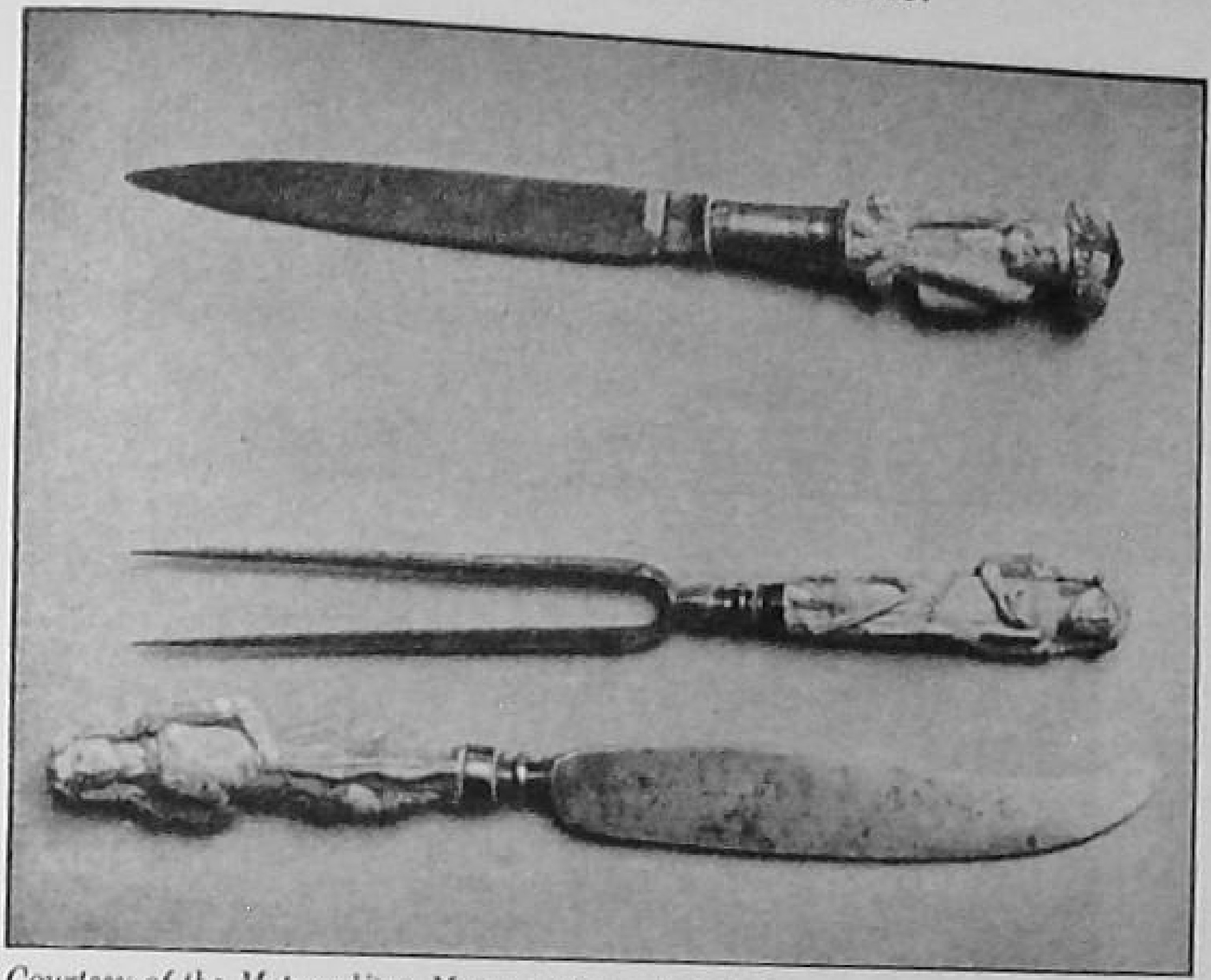
for any or all of the different meals. There are several qualities in each type of dinnerware. However, the grades have not been standardized and generally adopted, and the purchaser needs to examine carefully the wares he is buying. One should decide on the amount he has to spend for dinnerware and then choose the type accordingly. The possible wearing qualities should be considered. Dinnerware that chips and breaks easily, though low in first cost, may in the end be expensive when the replacement costs are counted. Attractive dinnerware is available in all types and price ranges. Dinnerware that would have cost a fortune and been the envy of the wealthy centuries ago today is within the reach of families with average incomes. The same is true of other table appointments.

Glassware

The making of glass, like the making of pottery, is an old art. Table appointments made of glass have long been used and continue to be popular. Glassware comes in a variety of colors and styles and in both expensive and inexpensive grades. Though entire sets of dishes are now made of glass, the favored pieces are tumblers, goblets, pitchers, sugars and creamers, sherbets and sauce dishes, frappé and cocktail glasses, and salad or dessert plates. There are two kinds of glass, lead glass and lime glass, the former being the more expensive. Glassware is either blown or molded, the blown being more beautiful and expensive. Glassware adds greatly to the attractiveness of the table. Some foods appear to better advantage in glass than in dinnerware. Glass is more suitable for cold foods than hot unless it has been specially treated to withstand heat. Foods cooked in heat-resistant glass are usually served in the dish in which they were cooked. The plainer patterns of glassware are usually a better choice, and care should be taken to see that the glassware harmonizes with the other dishes in color, shape, size, and quality. As a rule, glass that is clear, smooth, transparent, and free from cracks or bubbles should be selected.

Flatware and holloware

Guests and members of the feudal household brought their well-sharpened knives to the table with them, and were charged by the usage of the time to see that they were clean and in condition and that they were not used to convey food to the mouth. Wooden spoons were in common use until the fifteenth century, when they were partly replaced by pewter, brass, or tinned iron spoons. It seems probable that forks for serving foods evolved first through the making of holes or slits in a



Courtesy of the Metropolitan Museum of Art, New York

Fig. 154

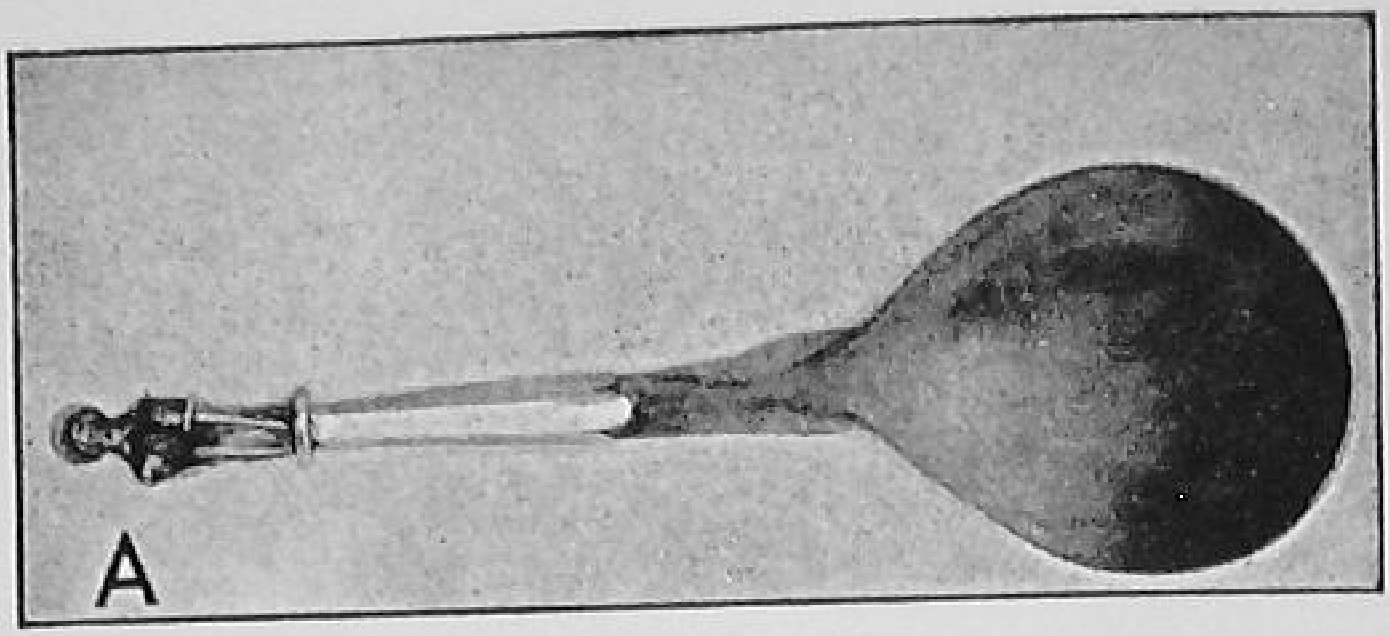
Knives and forks like these were used in the eighteenth century.

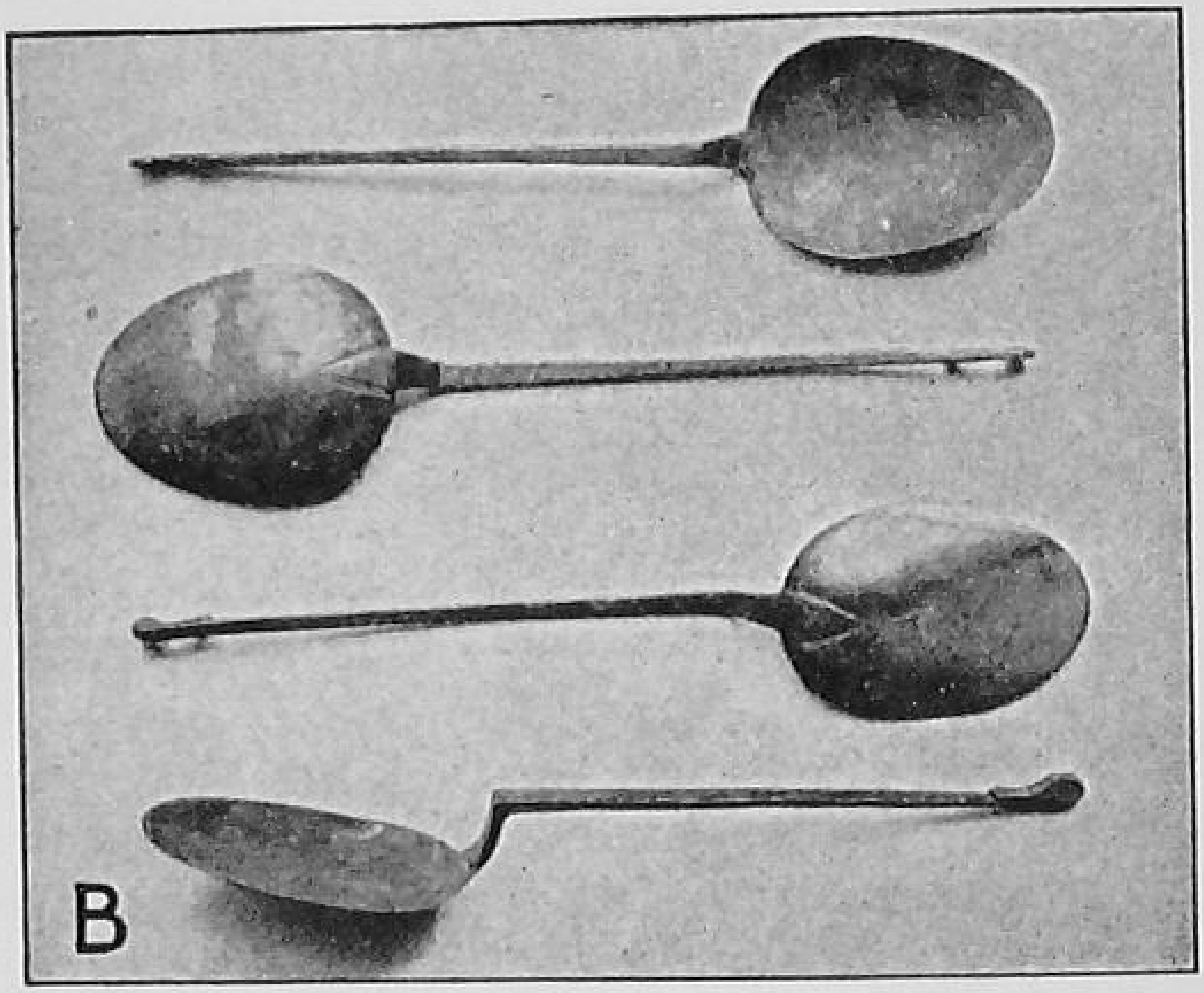
spoon so that the liquid might be drained off, and then later by the extension of these slits or cuts into tines. However, there was no direct transfer of the cooking or serving fork to table use. The impetus for the practice of their use at the table is said to have come from Italy about 1600. Master Thomas Coryate, in his *Crudities*, published in 1611, says:

> The Italians and also most straungers that are commorant in Italy doe always at their meals use a little fork when they cut their meats. For while with their knife which they hold in one hand they cut the meate out of the dish, they fasten the fork which they hold in their other hand upon the same dish so that whatsoever he be that sitting in the company of any others at meals should unadvisedly touch the dish of meate with his fingers, from which all at table doe cut, he will give occasion of offence unto the company as having transgressed the lawes of good manners, in so much that for his error he shall be at the least browbeaten, if not reprehended in words.[1]

Knives, forks, spoons, and other serving pieces are termed "flatware"; teapots, creamers, sugar bowls, goblets, and other serving dishes are "holloware." The most used metals for flatware are silver and stainless steel; and for holloware, silver, aluminum and pewter. Because silver was

[1] Sir D'Arcy Power, *The Foundations of Medical History*, pp. 60–61. Quoted by special arrangement with the publishers.





Courtesy of the Metropolitan Museum of Art, New York

Fig. 155

Early spoons were shaped to accommodate the food and the way of eating. *A*, an apostle spoon of the sixteenth century; *B*, several Roman spoons of the Empire period, said to have been found at Boscreal.

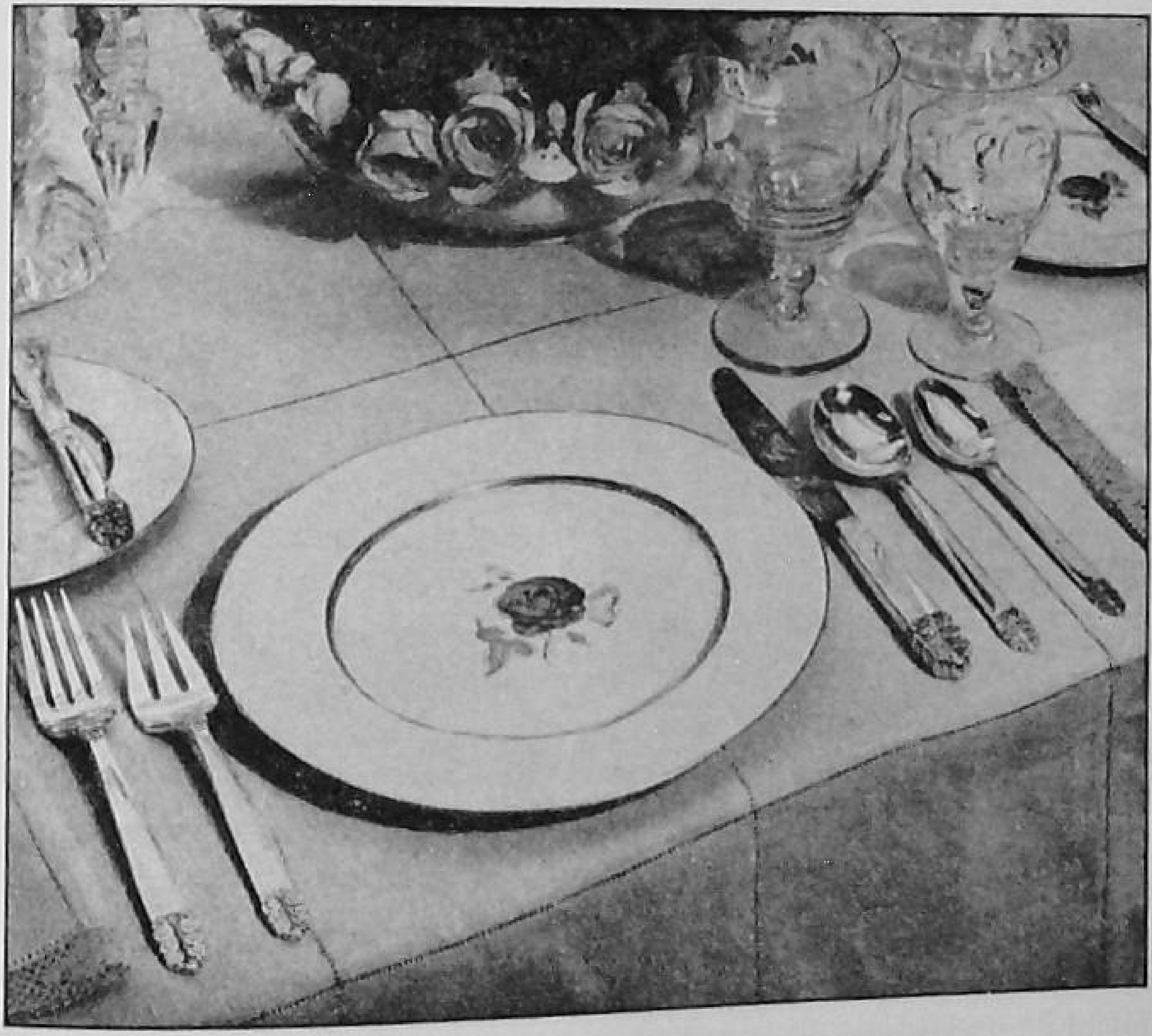
long the chief metal used for flatware and holloware the terms silverware and silver are often used to designate these table appointments.

Silverware is of two types: sterling, sometimes called solid, and plated. Sterling silver is an alloy made of 925 parts of silver combined with 75 parts of copper and is the same throughout. Its wearing qualities are high, but it is expensive. Plated silver is made by depositing a silver coating on a metal base by means of electrolysis. There are different grades of plated silver, the quality depending upon the metal base and the number of ounces of silver in the plating. The terms single, double, and quadruple plate indicate the amount of silver used in plating. Of these, quadruple

plate contains the most silver. The best metal base for plating is an alloy of copper, nickel, and zinc known as "nickel." In modern times knife blades in all these wares are usually of stainless steel.

Stainless steel flatware is made in a number of grades, the better ones being comparable in price to the best plated silverware. A flatware of the more expensive type, known as dirilyte, an alloy with the appearance of gold, is now on the market. Though these are beautiful in appearance, most people still prefer the silver-colored flatware for their tables. Complete place settings and serving pieces can be obtained in all of these types of flatware.

Beautiful designs and patterns are now made in all types of flatware and holloware, and a table can be attractive even if the inexpensive types are used. The moderately plain patterns are usually the wiser



Courtesy of International Silver

Fig. 156

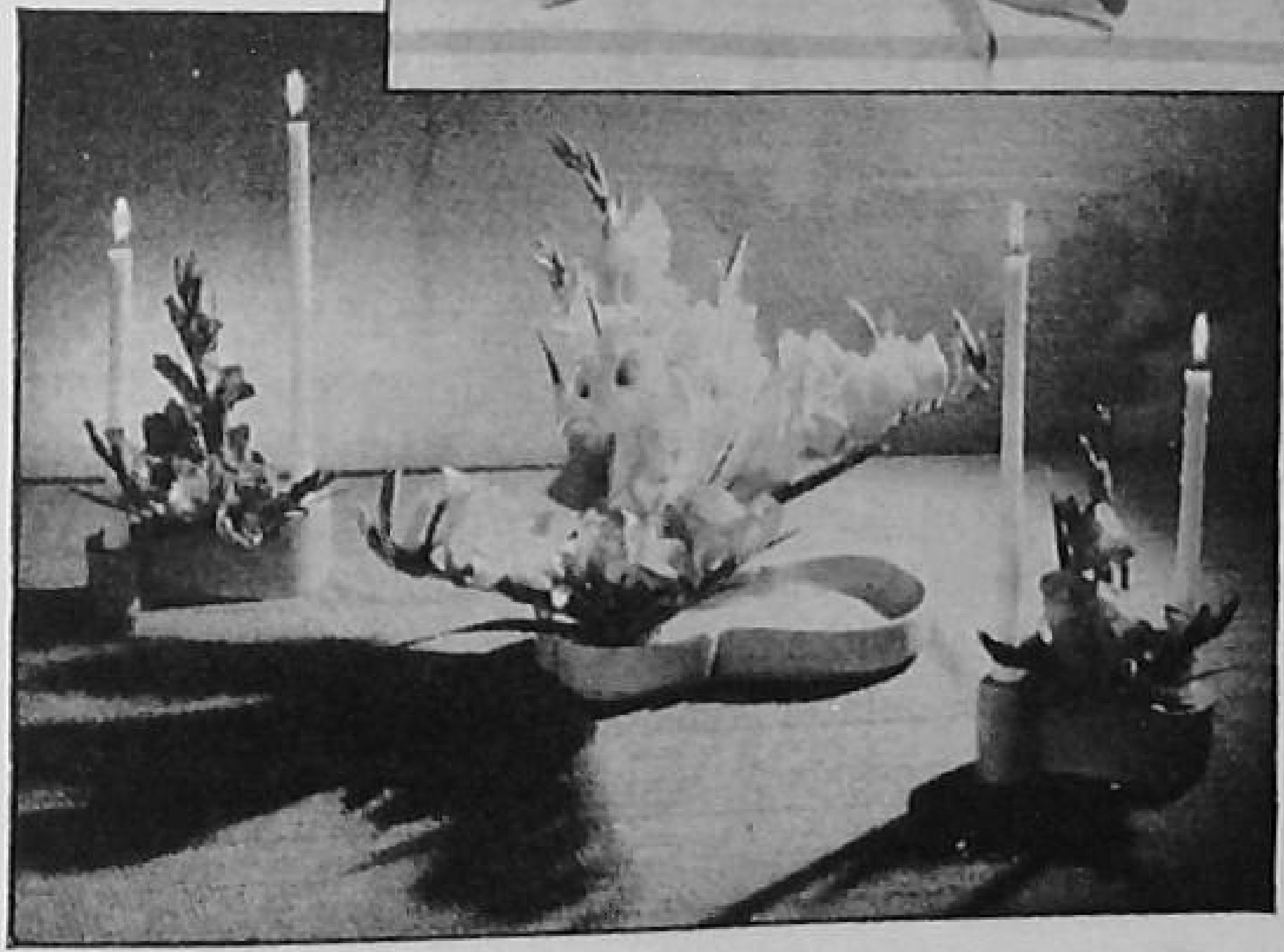
This place setting is correct for either an informal dinner or a formal luncheon. The silver is a modern pattern which combines simplicity with ornament.

choices, since they are more easily cared for. In both flatware and holloware, the extremely plain and the highly decorated patterns are the most difficult to care for. Silver tarnishes easily, and at best requires much care to keep it attractive and in good condition. The opposite is true of stainless steel. Flatware, like dinnerware, may be purchased in sets or cases for one, two, four, six, eight, or twelve covers or by individual pieces. A common practice is to purchase a few pieces at a time and gradually build up a complete set. The type of flatware purchased will depend primarily upon the money available for the purpose. Though plated ware is the most commonly used, stainless steel is increasingly replacing this ware. Sterling silver is so expensive that families of moderate means find the investment incurred in its purchase is out of proportion to the values received. The family budget may be sadly unbalanced if such purchase is made without careful consideration of the family income. The table linen, dinnerware, and glassware to be used with the silver also should affect one's choice, as certain types and designs go better together than others. Table appointments as a rule should all be of about the same quality.

Table decorations

Decorations have come to have a significant place in table appointments. At even the simplest family meal, a small bowl of flowers or a potted plant in the center of the table will add to the pleasure of those present. Many things are used for decoration — flowers, plants, fruits, vegetables, seeds, grasses, branches of trees and shrubbery, candles, and decorative objects. Holders for these include vases, bowls, bottles, platters, mirrors, and candleholders of various types. Pottery, glass, silver, pewter, brass, copper, aluminum, and wood are the materials of which the holders are commonly made. Flowers, by far the most used of the table decorations, are always suitable and can be used for any type of meal. Candles are next in importance and are often used with flowers or other decorations for special occasions. Table decorations often carry out a color scheme or the theme of certain ideas, seasons, and events, which may be further featured in the food served. For example, a Mexican luncheon is effective if the table linen and decorations and even some of the dishes are Mexican. The Christmas season suggests "snowy boughs," Christmas trees, holly branches, candles, Santa Clauses, and reindeer as decorations. Red and green still remain the favorite Yuletide colors, even though other combinations have in recent years been introduced as suitable for this time of year. The holders or containers for

Courtesy of Jessie Tarbox Beals

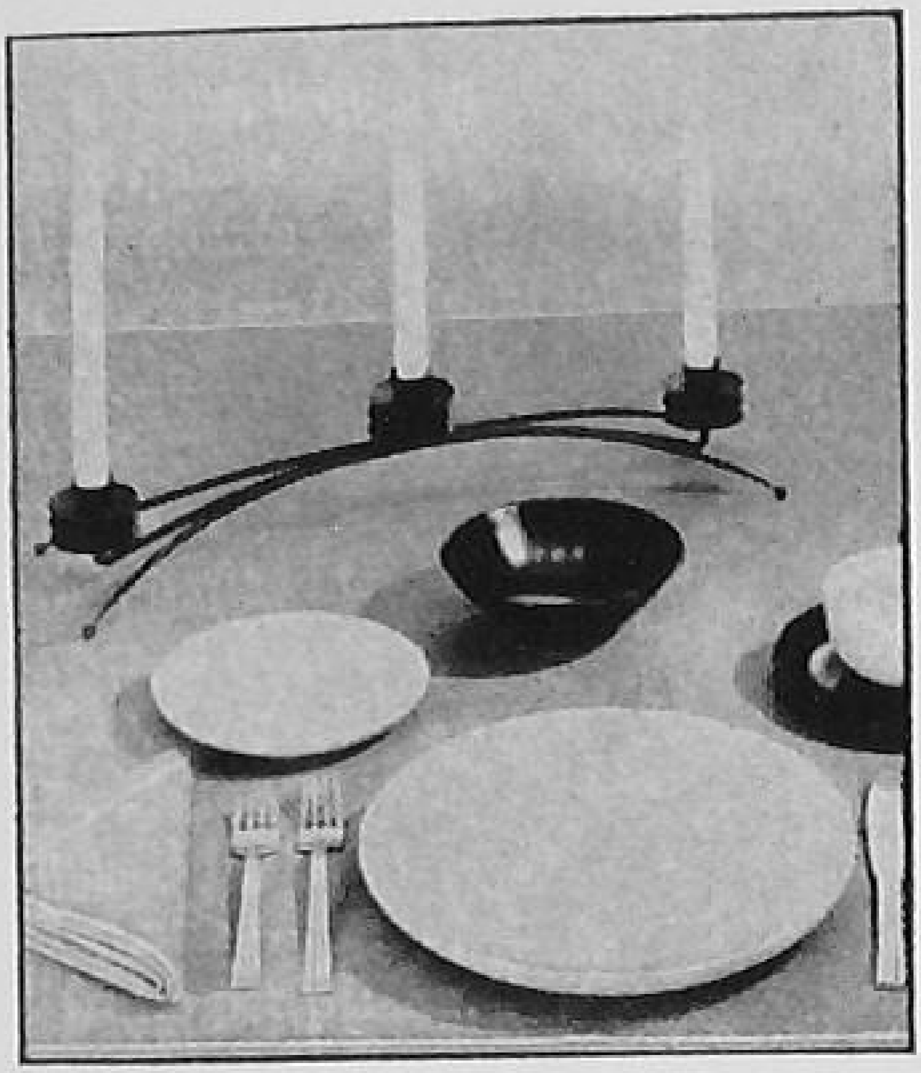


Courtesy of The Haeger Potteries, Inc.

Fig. 157

Table decoration may show great variety. Vegetables are effective, especially in fall and winter. Flowers, of course, give almost infinite variety in color, mood, and degree of formality at every season of the year. Candles may also be used for effective centerpieces, alone, or with other decorations.

table decorations are important, for they often become a definite part of the decoration. They should be appropriate to what they hold or contain and in keeping with the other tableware. In their selection these two questions should be kept in mind: "Will this particular article fit in well with the other table appointments?" "Is it something that can be used frequently?"



Courtesy Prolon Plastics

Fig. 158

Candles grace this table.

Table decorations should be appropriate for the meal, its service, and all the tableware. They should add to the meal and in no way detract from it. Their size should be in proportion to the size of the table and in harmony with the surroundings. The money spent for table decorations should be in proportion to the cost of the meal. A suggested guide for accomplishing this is to keep the cost of the decorations within one tenth to one fifth of the total cost of the meal.

The exact amount or number of table appointments desirable to have on hand cannot be stated, because people differ so much in their interests, needs, and customs. The type of table service used regularly, the frequency and number of guests, and the type of meals used for entertaining are determining factors. There should be sufficient table appointments to take care of the activities related to the serving of food satisfactorily. What this amount or number is can only be determined by first analyzing the situation, making estimates, and then checking against first-hand experience.

ACTIVITIES

1. A young woman who is soon to be married has seventy-five dollars to spend for table linens. Suggest how she might plan her expenditures?
2. Examine the dinnerware for sale in the community where you live. How many types can you identify? Characterize each type, and indicate conditions which might lead to its choice.
3. Find out the price of a set of dishes of a given size in each of the different types: porcelain, semiporcelain, earthenware, and plastic ware. How do their prices compare?

4. How do the prices of similar pieces of lead glass and lime glass compare? For what table appointments is glass most suited? Why?
5. Find out the prices of a given set of flatware in sterling silver, in various weights of plated ware, in dirilyte, and in stainless steel. For what income levels would you recommend each?
6. Choose a silver pattern, and decide what other table appointments would harmonize with it in mood and design. Report your decisions to the class.
7. Describe the table decorations for the meals that you planned in activities 1, 2, 3, Problem 7, this unit (page 694), with due regard for cost.
8. Plan decorations for the following: a family Thanksgiving dinner; a Saint Patrick's Day luncheon for an afternoon bridge club; a child's birthday dinner; a formal New Year's Eve dinner.

PROBLEM 5 *What is effective kitchen sanitation?*

Effective kitchen sanitation is based on wholesome attitudes toward health, knowledge about health, and the wholehearted acceptance of sanitary measures and procedures evolved for its protection. Unless the attitudes held express esteem for the "sound and healthy" the directive toward expending time and effort in safeguarding it will be of slight value. Unless there is knowledge of the spread of infection, the control measures adopted may be as ineffectual as charms and tokens once esteemed as essential. Unless the knowledge and the understanding of health are channeled into the habitual procedures and practices of responsible persons, there will be numerous gaps in any plan for health security measures.

Rodent and insect control

Obvious measures to provide sanitation include those taken to assure that the food, the work space, the storage space for food, dishes, and utensils shall be clean, rodent proof and insect proof. Unless this is done, safe food brought into the home may be polluted, either by direct contact with the pests or by dirt and infected material carried or excreted by them in their travels over work counters and sinks and by their contacts with dishes and equipment. The "mouse traces," sometimes thoughtlessly brushed away from work surfaces, actually are signals of danger threaten-

ing the household which call for a thoroughgoing campaign to trap the rodents invading the place and to make the structure, old or new, completely *mouse tight*. They indicate also need for a clean-up that will make the kitchen galley sanitary. Insect infestations need similar campaigns for their effective control. They likewise create filth and spread disease. An extensive roach invasion may even require the services of a pest control agency. If such assistance is not at hand, instruction on measures to be taken are usually available from the Department of Entomology of the agricultural college in your state. Once these visible violators of health security are brought under strict control, they may be kept there by continual vigilance and care that the kitchen is sanitary and clean at all times.

Trash and garbage disposal

Paper in which food has been wrapped and paper boxes used in delivery should be emptied, discarded, and burned promptly. Emptied tin cans and glass jars should be rinsed and placed in a trash container away from the kitchen. Food spilled on counter surfaces should be wiped up and the counter surface should then be washed and dried.

Flies, sometimes designated as the *typhoid fly*, live and breed in filthy places. Attracted by food, they are drawn to the kitchen and enter through a break in the window screen or a door left ajar. Once in, they pollute food with disease-producing bacteria. Effective screening of homes against their invasion and the use of DDT or other effective insecticide on their breeding places are important means of lessening the health hazard they present.

Garbage or food waste which attracts flies may be collected by the city or by an operating firm designated as the agent of the city. Until its collection is made, it should have temporary storage in metal cans with tight fitting lids. These cans should be scrubbed frequently, rinsed and treated with a disinfectant such as a chlorine solution.

Mechanical food waste disposer units (see Figure 159) for home use have replaced garbage cans in many kitchens. The food waste is ground fine by an electric grinder installed to empty in the drain. The pulverized waste is carried down the pipes by the force of a swirling stream of water which prevents clogging and stoppage in the drain. In rural homes where provisions for garbage disposal such as have been described are lacking, a compost pit may provide a place where it can be buried with other organic waste for a period of decomposition, after which it may be used as a fertilizer.

Kitchen care

The kitchen should be kept clean so that the tasks of food preparation and service may be carried on in it without any hazard to the health and security of the family members. Though weekly care varies, included are such items as wiping down the walls; washing the light fixtures, the windows, sills, and cupboard and other doors; washing heavy equipment such as the refrigerator and range. At frequent intervals the dishes, kitchen utensils, and supplies are taken from the cupboards and drawers. These spaces are wiped out, let dry, and the contents are returned to the spaces. Counters and work spaces are washed, and, last but not least, the floor is thoroughly cleaned. When completely dry, both it and the counter space are waxed well. Routine attention as specific as this provides an excellent opportunity for inspection of every corner and crevice as an added gain.

The daily care includes attention to drains and sinks, the wiping of counter surfaces, and the sweeping of the floor after the clean up of work centers is done.

Hygienic practices

Even after all these suggestions regarding effective sanitation are observed carefully, there yet remains the possibility of one of the family members becoming infected with some one of the sixty-two or more different organisms causing disease and, ignorantly or carelessly, communicating it to the other members of the household. If the infection is of the respiratory tract, as a cold, it can be spread directly by person-to-person contact or by spraying droplets of infective moisture into the air by coughing or sneezing; or it may be spread indirectly, as from person to handkerchief, from soiled and infected handkerchief to doorknob or book to person. Or it may be passed from person to spoon, fork, or plate which have held these, or to cup or glass; these articles, washed but incompletely sterilized, may convey the organism to another person.

Sometimes disorders such as "intestinal flu" or typhoid fever, which strike at the intestines and are present in the excreta of an infected person, are passed on because of a helper's failure to wash his hands thoroughly following going to the toilet. Only a person who is sound and well should handle food, or dishes, glasses, and silverware to be used in the service of food to other persons because of the hazard in person-to-person contact.

Sanitary procedures to be accepted and followed include:

1. Wash hands with soap and water before beginning work regardless of how

hands are soiled — after use of the handkerchief, after each visit to the toilet, and after handling food packages, dustpans and the like.

2. Keep work surfaces clean at all times, wiping up any spillage at once.
3. Use only clean utensils and dishes in the preparation and service of food.
4. Take hold of utensils by the handles, and of dishes and glasses in such a way that the serving surface is not touched.
5. Use a tasting spoon for any sampling of food and do not return the spoon to the food after it has been in your mouth.
6. Refrigerate unused foods.
7. Keep refrigerator and other food storage places scrupulously clean.

Dishwashing

The dishwashing procedure to be followed looms up as a matter of major concern when the usual chain of infection with communicable diseases is known. It is not enough that the dishes should look clean, being free from particles of food, or feel clean, free from grease or stickiness. They must *be* clean, free from the bacteria we cannot see, but whose collective strength we have reason to fear. It is effective sanitary practice to provide for the addition of a sanitizer to the dish water and to maintain the temperatures of dish water and rinse water at the highest temperature practicable with the method of dishwashing employed. For hand dishwashing, the highest temperature usually maintained is 120° F.; for mechanical dishwashing, 140° F. or more may be reached. Bacteria on dishes are killed when exposed to water at 170° F. for several minutes. The gap between 120° F. and 170° F. indicates that current procedures often fall short of being effective unless a sanitizer is used.

Washing dishes by hand

In forty-four out of forty-five American homes, hand washing is the procedure followed. Desirable equipment for dishwashing includes two dish pans (or one pan and a drain board), a wire drainer or rack, dishcloths, a plate scraper, a dish mop if desired, a metal dishcloth, steel wool, soap, polishes, scouring powder, and dish towels. Plenty of hot soapy water, clean towels and cloths, adequate facilities for rinsing with hot water, and a clean and protected place for storage are needed.

Some order for washing dishes should be decided upon and followed regularly. The following sequence is suggested: glass, silver, china, greasy dishes, kitchen utensils. The water should be changed as often as necessary for well-washed dishes. It is generally regarded as satisfactory to wash and put away many of the utensils while waiting for the various foods to cook. All grease and scraps of food should be removed from the

dishes and utensils before they are put into the soapy water. They should be stacked according to kind in the order to be washed and placed so as to be convenient for the one washing the dishes. Dishes and pans with food adhering to them should be put to soak.

The following steps and procedures are recommended, based on study of motion economy in dishwashing:[1]

1. Wash the dish at water level to eliminate carrying water in the cloth to the dish.
2. Wash the dish with a circular movement in order to move in the easiest manner and to allow the cloth to be self-dipping in the action.
3. Retain cloth in right hand (if right-handed) except when reaching for dishes. A common error is that of groping for the dishcloth many times during the dishwashing period and thus wasting both time and effort.
4. After washing one item move the hand with the cloth to the next item to be washed. This puts the cloth in position while the other hand disposes of the washed dish.
5. Use the left hand to pivot the dish during the washing process instead of turning it with both hands.
6. Place the washed dish in position to be scalded, with the hand nearest the drainer or tray. Reaching across the body to dispose of a dish requires a longer time and more motion.
7. Rinse dishes. A satisfactory rinsing procedure provides for placing the washed dishes in the drainer in such a way that water can reach all surfaces, and then in pouring boiling water over them and allowing them to dry without wiping. Some cooking utensils require thorough drying, and wiping with a towel is usually more effective for this purpose than drying over a flame or in the oven. If drying is an accepted step in dishwashing procedure, towels used should be clean and dry. When drying dishes, save motion by holding an end of the towel in each hand, keeping the hands close together and close to the dishes. After the complete process of dishwashing is finished, dishcloths and towels should be hung on a rack to dry, or if to be used again before laundering, they should be washed out in hot soap suds, rinsed, and hung to dry. The dishes and utensils and the dishwashing equipment should be stored in their proper places when the dishwashing process is completed.

A study made some years ago at Cornell University indicated that dishwashing for a family of four, which included clearing the table, putting the food away, stacking and washing the dishes, wiping and putting away the silver and glassware, setting the other dishes to drain, cleaning

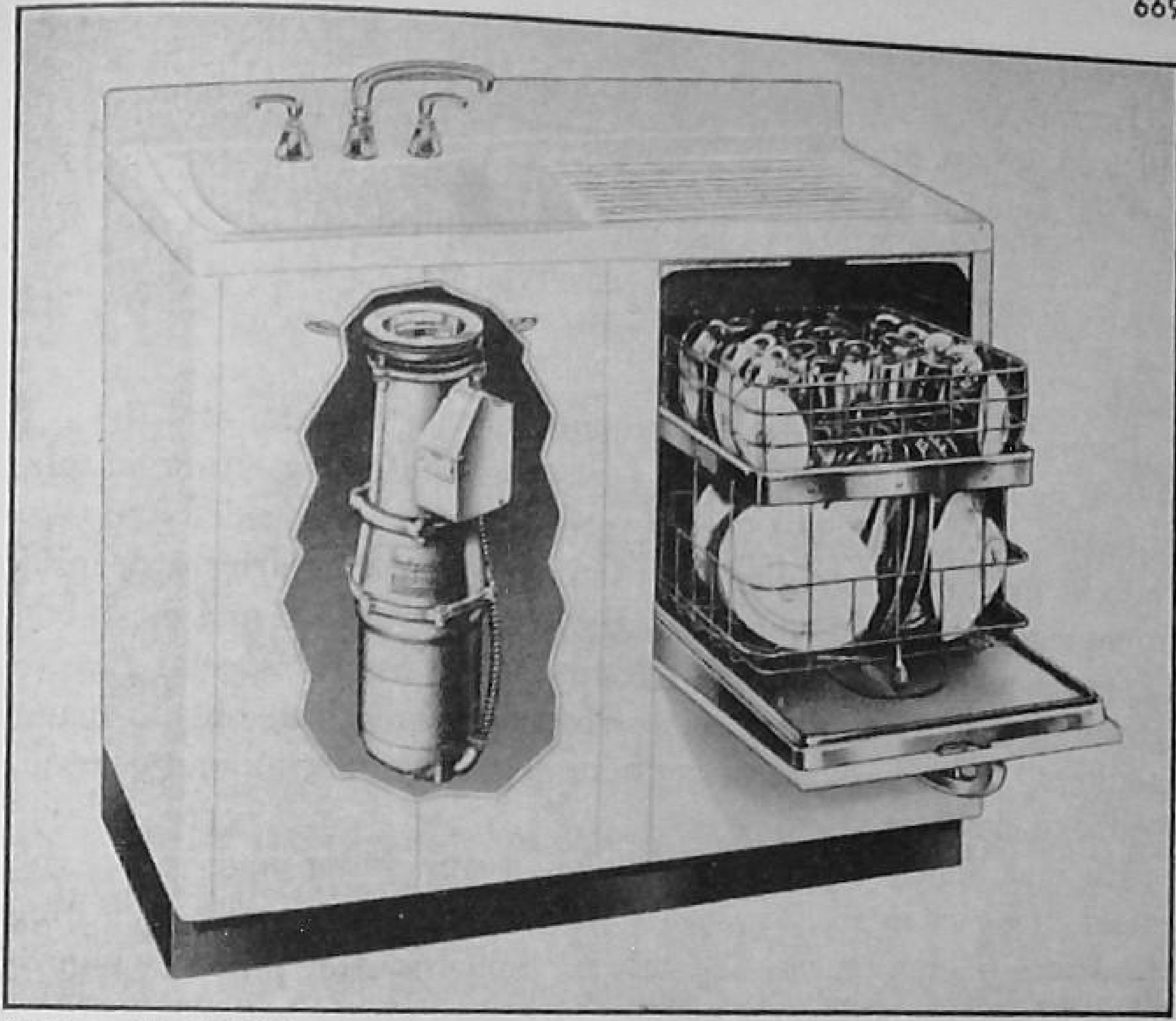
[1] Eva L. Goble, "Work Simplification in Dishwashing." *Journal of Home Economics*, vol. 40, no. 4. April, 1948.

the sink, caring for the garbage and garbage pail, washing the dish towels, and once a week washing the bread box — required for each meal an average of approximately sixteen minutes, or about four minutes for each person served. The total daily time spent in dishwashing averaged around forty-eight minutes. If this time is compared with the longer time spent by many homemakers in this activity, the importance of adopting timesaving methods is at once recognized. The study also showed that two persons working together could wash the dishes in about half the time required by one person, but that a third helper lessened the time of the two only slightly. If efficiency alone is considered, it may be well for one person alone to be responsible for the dishwashing.

Dishwashing in the electric automatic dishwasher

The process of dishwashing by the electric automatic dishwasher differs somewhat from washing by hand both in procedure followed and the time required. A suggested procedure is:

1. After all grease and scraps of food have been removed from the dishes and utensils, the glassware, silverware, china, dishes, and utensils are often rinsed under the hotwater faucet and then put in the racks. This step was regarded as a *must* in the early dishwasher models. Instructions on the use of recent models may or may not list it as of primary importance. (Some makes of dishwashers state flatly in their guarantee that rinsing prior to washing is not needed for successful washing.)
2. Then, the dishes are loaded into the machine, the detergent added, the door closed, and the machine turned on.
3. The dishes are washed, rinsed (usually twice), drained, and dried automatically. Also the dishwasher automatically cleans itself. The temperature of the water is 140° F. to 160° F., about 30 degrees hotter than hands can stand. The time required for this method of dishwashing is seven to ten minutes including loading and unloading. Flatware and utensils can be washed successfully in some of the machines. However, a light toweling may be needed for flatware and glass; otherwise water spots may show on the finish.
4. If spotting occurs, the root of the trouble may be that the specific detergent selected is not well suited to the hardness of the local water supply; hence, a shift in detergent may be necessary. It may be that, in addition to excessive hardness or apart from it, the water supply contains high iron content. This condition can be remedied only by the installation of water-conditioning equipment.
5. Chinaware and glassware, properly placed in the rack, are held steady, without motion, while being washed, so breakage or chipping is rare. Of the plastic dinnerwares, the melamine plastics are not harmed by the action



Courtesy of Hot Point Co.

Fig. 159

Labor saving devices which facilitate kitchen sanitation

nor by temperatures reached in the electric dishwasher. This is not true of the lighter weight and less expensive plastics of polystyrene and polyethylene. Neither of these can stand the temperatures that are reached in the automatic dishwasher during the drying period.

Care of small equipment

Egg beaters, bread boxes, and milk bottles all need special attention. Egg beaters should be washed, rinsed, dried, and hung up immediately after using. The bread box should be emptied at least once each week and thoroughly washed, scalded, and air-dried. Milk bottles should be rinsed with cold water as soon as they are emptied, washed in hot soapsuds, scalded, and placed to drain without wiping. Bowls in which onions or similar strong-flavored foods have been chopped should be thoroughly cleaned before being used in the preparation of other foods, especially delicate-flavored ones and those with which the strong flavor makes an unpleasing combination.

Cleaning kitchen equipment

The range should be cleaned after each meal or each time that it is used. All food, grease, or other substances should be carefully removed, and a method suited to the particular range should be used for further cleaning. Enameled finishes can be washed with water and dried. Iron and steel can be washed and a range polish of some type applied to keep them looking well. Chromium trimmings require frequent polishing with a dry cloth.

Proper care of the refrigerator requires keeping it clean and dry. It should be thoroughly washed with cool water containing either washing or baking soda, rinsed, and dried at various intervals as needed and especially at the time of defrosting. Any food spilled on the refrigerator inside or out should be wiped up immediately. Only clean food and clean containers should be placed in the refrigerator. Rules for special care required by each kind of mechanical refrigerator are given by the manufacturers. These include procedures for defrosting, placing and covering food, and cleaning.

The sink should be washed with hot, soapy water and thoroughly rinsed after each meal. If necessary, it should be scoured with a cleaning agent that will not roughen the surface. Some scouring powders remove the dirt but also roughen the surface. Grease or greasy water should not be poured into the sink. It not only makes the sink more difficult to clean, but may clog the drain pipe so that the flow of water down the pipes is retarded or stopped. When pipes are stopped, sometimes a solution of potash in water or lye in water will open them. The solution should be kept in the pipes twenty to thirty minutes and then well washed down with boiling water. A number of commercial products are available to keep drains open. Whichever is used, care should be taken not to allow it to touch the enamel.

The method used in caring for table tops depends upon the material of which the top is made. They should be washed and scoured regularly and kept in good condition. Kettles and other utensils should be cleaned and scoured, and all should be thoroughly cleaned and dried before being put away.

Electrical equipment should be carefully cleaned after using according to the directions provided by the manufacturer. Care should be taken not to allow the plugs and connection points to come in contact with water. Cords and plugs should be hung on hooks or stored in such a way that the wires are not broken or injured.

Silverware needs special care to keep it attractive and in good condition,

because it discolors or tarnishes readily due to the sulfur compounds in the air, in rubber and wood, in certain foods, and in some dyed and bleached materials. Methods to remove tarnish may be classed as abrasive polishes, such as the conventional creams, liquids, and polishing cloths; electrolytic cleaners; and the diptype cleaners. Of these, the last two are not advised for antique or oxidized silver articles. Whiting or chalk mixed with ammonia to form an abrasive polish and then applied to the silver with a soft cloth or brush is a satisfactory method. The paste is allowed to dry and is then rubbed off with a soft cloth or brush. A number of commercially prepared abrasives for cleaning silver are available.

The following is another widely used procedure for electrolytic cleaning of silver: Fill a porcelain kettle about three fourths full of water, to which has been added one teaspoon of washing or baking soda and one teaspoon of salt for each quart of water. Place a piece of aluminum in the kettle and boil the silver for five minutes, taking care that the water completely covers the silver. Then rinse the silver and polish it with a soft cloth.

Aluminum should be washed after each use in hot, sudsy water, rinsed in clear hot water, and allowed to dry thoroughly. Slight discoloration or spots may be removed by rubbing with fine steel-wool pads and soap, followed by thorough rinsing and drying. Cooking tomatoes, applesauce, rhubarb, or spinach in aluminum utensils also brightens them without affecting the foods cooked. On aluminum utensils with a highly polished finish a fine cleansing powder is recommended instead of steel wool. Stubborn discoloration may be removed by boiling for twenty minutes in a solution of two tablespoons cream of tartar to each quart of water, using enough of this solution to cover discolored area. After standing until cold, the utensil may be rubbed with steel-wool pads and soap, washed, rinsed, and dried. The hammered finish on some makes of cast aluminum may be cleaned by rubbing with pumice and powdered soap, using a fine wire brush.

Brass and copper require regular care. Copper discolors from heat of cooking and both do from exposure. Special metal cleansers are available which keep brass and copper clean and bright with little or no rubbing.

Cast-iron utensils, when new, unless so labeled should be "preseasoned" before using to prevent rusting. If an anti-rust lacquer has been used on the metal, it must first be removed. Then when the utensil is clean and dry, it should be covered inside and out with unsalted fat, and heated for several hours in a warm oven (250° to 300° F.). After cooling, cast-iron utensils should be washed in hot, sudsy water, rinsed, and allowed to dry. If not thoroughly dry, even seasoned utensils will rust. Manufacturers

recommend that soap be used in washing cast-iron utensils. Synthetic detergents remove the fat from the pores of the iron and thus allow rusting of the metal.

Earthenware or pottery is washed with hot, sudsy water, and well rinsed with hot water. Special precautions must be taken to assure that articles of this material are protected from blows or sharp knocks, harsh abrasives, and knife scraping. The temperature of the pottery dish and that of the food to be cooked in it should be about the same when put into the oven. The hot pottery dishes should not be put into cold water or on a cold, wet work surface.

Glassware should be washed in warm, sudsy water, rinsed thoroughly and dried. Scorched food may be removed from glass utensils after soaking with water and baking soda. A mild abrasive may be used to remove the white film sometimes left by some starchy foods. Mineral deposits from hard water may be removed by boiling vinegar and water in the utensil. Charred-on food and other fast-clinging stains should be removed with scouring powder or steel wool.

Pewter can be cleaned with whiting or chalk and water; it should be rubbed with the grain. A special cleaner is sometimes available for pewter. Silver creams and pastes can also be used successfully on it if the discolorations are not too deep.

Porcelain enamelware is washed in warm or hot sudsy water, rinsed and dried. If food sticks to enamelware, it should be soaked loose and removed with a rubber plate scraper. If food is burned in the utensil, it may be loosened by boiling a solution of two tablespoons of baking soda to each quart of water. Baking soda or a fine nonabrasive cleanser may be used to remove stains, or the utensils may be soaked for about fifteen minutes in a solution of three tablespoons of household bleach in a quart of water.

Stainless steel tableware and utensils are easily cleansed in warm, soapy water. If food has adhered to a pan, it may be loosened by soaking in soapy water prior to washing. After washing, stainless steel should be rinsed, and dried.

Woodenware should be cleaned immediately after use so that no undesirable flavors and odors will be absorbed. This ware should never be soaked or immersed in water. Salad bowls should be wiped out with a paper towel and rinsed quickly with lukewarm water. Other pieces are washed with cold water, scrubbed with lukewarm soapy water, and rinsed with cold water; as little water as possible should be used. In both procedures the articles should be thoroughly dried. Woodenware should never be polished, rewaxed, or shellacked, and it should be stored in a dry, cool place.

Cleaning tools such as brooms and brushes should have the dirt removed from them and should be stored in a dry place in a manner that will not spoil their shape or usefulness.

ACTIVITIES

1. Plan an efficient procedure for washing dishes and test it out, noting the condition of the articles washed.
2. Make a time and motion study of dishwashing. Report the results in time saved, satisfaction in work, and the methods of procedure followed.
3. Study the record of your state in the matter of food-borne diseases for the past two years. Report your findings to the class, giving the kind and scope of the disease, the causative factor, if known, and the manner of its transmission.
4. The Jones family members have "gone from one cold to another" all winter. If you were asked to help them establish cold control what would be the points of kitchen sanitation that you would check? List steps you might take to lessen the spread of infection.
5. Participate in a class discussion of "The Family's Responsibility for the Health of the Community."

PROBLEM 6 *How do managerial and culinary abilities and skills affect efficiency in meal planning, preparation, and service?*

The term *managerial* is derived from *management*, usually defined as the "*judicious use of means or resources to accomplish desired ends.*" The *means* are often listed as "*the four M's*": (1) *material;* (2) *money* — the cash which makes possible the obtaining of needed commodities and providing operating expenses; (3) *man power* — the labor resources required to staff the organization, service, or project; and (4) *mind power* — the *managerial abilities* and *skills* which provide for the establishment of goals and direct the judicious use of means to attain these.

To a large extent, the managerial abilities are found to be related to the *maturity* of the person attempting to manage. The indices of maturity

are of concern to any who have or are preparing to assume managerial responsibilities in almost any field. These are:

1. The ability to make decisions and to abide by them.
2. The acceptance of responsibilities and obligations.
3. The refusal to seek alibis or excuses for an awkward or unpleasant situation.
4. A reasonable detachment of one's self from one's work.
5. The ability to see issues clearly, and to take action without confusion or delay.
6. Perseverance.
7. Cheerfulness.

Broadly speaking, the over-all managerial abilities and skills of the homemaker enable the family to establish the goals it desires to attain by the various activities of family life and to direct their efforts to that end. Further, through consideration of these goals, the family is enabled to see clearly which of these are of major importance and which of minor importance as well as which are of direct and immediate and which are of continuing and long-time concern. The homemaker or other family member who is an effective food manager will formulate sound plans for proceeding toward the desired goals, accepting time as being necessary for worthy growth in individuals. Appreciation of competence and enjoy ment of work, good health and nutrition, and acceptance of existing social usage are not achieved overnight but evolve in the slow growth of a personality.

Courtesy of California Food Research Institute

Fig. 160

A snack of drop cookies and milk is attractive, nourishing and speedy.

In industry, managerial skills are said to be those involved in the four M's. These four categories — *manpower, mind power, money,* and *materials* — apply equally well to management in the home and to the varied phases of work involved in its operation. There is this difference: in industry, the goal of an organization is to perform a needed service in an efficient and acceptable way which will assure the continuance of the business and the return to the owners or operators of suitable interest on

their investment. The family usually has among its goals the happiness, day by day, of the family members; the healthy growth and maturing of each and all, physically, mentally, and emotionally; and the preparation of the children to become acceptable members of the social order of which they are a part. These are all long-time objectives or goals; progress toward them is difficult to measure at any given time or by any one device. One can count the money saved by frugal management of operating expenses or food costs with precision. One cannot be as specific in determining an evaluation of human growth and development under home conditions or of other personal and social values. This fact in no way negates the high importance of these values.

Resources of the home

The homemaker, most always the food manager in the home, wishes to achieve the desired ends on the available material, money, manpower, and mind power. The *manpower* of a high proportion of American homes is really the "womanpower" of the homemaker, supplemented to some extent by the services rendered by children assigned to simple and usual tasks or chores and those assumed by the husband and father in his after-work hours. Some women have hourly help for perhaps eight hours a week, but more do not. Some have important labor-saving devices but more do not. Most, if not all, must plan wisely and carefully if the use of the human energy available is to prove adequate for the job of making a home.

In the home, as in the factory, interest in and understanding of the job and its importance has much to do with the satisfaction of the worker and his performance on duty. The attitude the homemaker has toward each of the various jobs in food planning, preparation, service, and clean-up influences the other family members and sets the pattern of happiness or lack of happiness in undertaking and completing a given task in that home. The task, assigned or assumed, should not be too difficult for the person taking it on, nor should it be too simple if there are others with less skill who are able and ready to undertake it. This calls for the successful matching of "man and job!"

If the husband assumes some of the work in food preparation, he may make a significant contribution to the simplification of various time-consuming jobs by pointing out certain steps in the procedure that are unnecessary or can be made so, often reducing the time required by 25 to 50 per cent. Work simplification is hard to see if the matter has not been given hopeful thought. A woman was in the midst of putting a fill-

ing in a cake and a frosting on it which she was dotting into a pattern in which chopped cherries and candied mint leaves were used when her husband came home early. He took one look at the creation and said, "Is there a birthday party? If not, why don't you make the frosting with the cake when you bake it as you did last night?" From then on, *upside-down cakes* of various sorts have been featured in that household with a major saving of time and effort in meal preparation. Such changes in methods make it possible to produce taste-appealing food of high standard with less effort and less pressure to hurry, hurry, hurry.

Organization

The *mind power*, that is, the composite of managerial abilities and skills of the homemaker or food manager, is expressed in the plans for organization and dispatch of her job. *Organization* is said to be "the process of arranging the whole from separate but interdependent parts, providing a plan for interrelation such as may introduce order and system into a group of related activities, providing for the direction and development of these." Organization must precede production if there is to be efficiency and economy in operation, regardless of the size or the scope of the operating unit or the diversity of its activities. The *first step* in organizing is careful consideration of the values and goals the group has accepted; the *second* is the formulation of a plan for action directed toward achieving these goals; the *third* is the frank facing of possible difficulties: the *fourth* is a careful analysis of resources; the *fifth* is a tentative choice of a line of action; the *sixth* is testing of the tentative plan in action. The *seventh* step is evaluation of the results obtained in so far as these are measurable. The *eighth* step is the revision of the plan and the *ninth* is putting the revised plan into action. The plan in operation is subject to continuous scrutiny and modification at each stage of its evolution. By this means one may be developed that functions efficiently and effectively in a specific situation.

Abilities and skills of the food manager

Skill in the individual cookery processes enables the food manager to schedule the preparation of two or more of them to proceed simultaneously. For example, she may make effective use of oven heat and personal attention by preparing two or more foods in the oven at the same time. Her skill also enables her to check which recipes require last-minute preparation and which ones can be prepared earlier, possibly the day before.

Courtesy of United States Department of Agriculture, Washington, D.C.

Fig. 161

Skill in food preparation shortens the work hours.

Thus, a meal plan can be made relatively free from the stress of many things requiring attention at the same moment and at a late hour. The work can be distributed over the time at her disposal. She can also extend her knowledge and skills by observation and practice. Recognition of the various aspects of her job might be presented under the following headings:

1. *Responsibilities*
   (1) Is responsible for planning palatable and nourishing meals for the group.
   (2) Is responsible for food preparation.

(3) Is responsible for satisfactory meal service at the stated time.
(4) Is responsible for keeping work space and food preparation centers clean, sanitary, and in order during preparation and service.
(5) Is responsible for the clearing, sanitary washing, drying, and storage of flatware, holloware, glassware, and china.

2. *Job knowledge*
   (1) Should know principles of food selection and preparation.
   (2) Should recognize characteristics of standard products of the major groups of foods as vegetables, fruits, meats, fish, beverages, batters, doughs, custards, and pastries.
   (3) Should understand sound bases for menu planning.
   (4) Should know rules for simple and attractive food service.
   (5) (*a*) Should know the principles involved in the use of equipment used in food preparation.
   (*b*) Should know the care needed to keep equipment in good order.
3. *Skills*
   (1) Should possess the manipulative skills necessary in food preparation.
   (2) Should be accurate in measurements of liquids, solids and dry ingredients, in temperatures, and in timing.
   (3) Should appraise products honestly and fairly.
4. *Reward*
   (1) Should find satisfaction in the job at hand.

Planning the work

The various time-consuming and yet relatively unimportant activities in the meal preparation and service should be charted, showing how long each is expected to take, how often each occurs, and what are the limiting factors in their use. Then each is scrutinized to see if the use of another recipe or a new product, such as a "mix," would release significant areas of time needed for other duties. In the dining room there are possible simplifications in service which, if adopted, would release ten or fifteen minutes time for more fruitful use. Place mats of plastic may replace heavy damask table cloths, advantageously freeing several hours of the homemaker's time spent at laundry work. Likewise, time and energy required for serving an everyday meal in courses may be conserved for some more meaningful activity by placing the entire meal on the table and serving it with dignity yet with a minimum of getting up and down.

A work sheet enables one to take a quick view of a unit of work, such as the preparation and service of a meal and the cleaning-up activities that follow. A work sheet of this type calls for listing in consecutive order all of the things to be done and indicating for each the time of doing it and the person responsible.

Work simplification is defined as "the conscious seeking of the simplest, easiest, and quickest method of doing a given job." The steps to follow in work simplification include the following:

1. Select the job to be done.
2. List the activities comprising the job in detail.
3. Question each detail asking "why, what, when, where, how, and who," to quote Kipling's list of good servants.
4. Modify the plan for the job on the basis of your study, thus creating a new and better method of procedure.
5. Put the new method to work.
6. Note the saving of time and effort accomplished and check for further needed changes.
7. Check the product to see if it is standard.

Well-laid plans free the food manager from pressure so that she is able to carry these through and count chance out as a factor affecting the success of the meal.

Controlling food costs

The mechanics of managing money and material in the home are much like those in industry. Success in handling these is based on knowledge of standards for acceptable products and an understanding of the processes by which these are produced. Constant checks must be made on the money spent, the kind and quantity of material obtained, and on possible alternates which might be used for one or another of the ingredients in the recipe.

In a commercial cafeteria where food cost control is always important, the management requires a daily inventory of food bought and food sold, the establishment of standard portions (not too little and not too much), the calculation of the cost per serving for each recipe made, and a counter check showing the acceptability of the various dishes made available to the patrons. On the basis of known facts and collected data on public response, meals for the next week are planned, the recipes are indicated, the size of portion is determined, and if the market price has changed, the cost per portion is recomputed. These same steps are important in the food cost control of food prepared in the home. The computing of the cost per portion does not mean that father's or Johnny's consumption of corn custard or rolls is to be limited. Rather it points out that high consumption of a popular food may lessen the expected consumption of spinach or boiled cabbage. Knowledge of the cost per serving of pecan pie does not necessarily lead to its exclusion from the diet. Rather the cost of the

meal may be kept in line by use of a cabbage slaw, or other inexpensive item.

An appreciation of food costs should lead to the acceptance by the homemaker or food manager of tested and approved recipes. Variations in these recipes are wisely made only after a standard product has been successfully made several times and the degree of acceptance by the family has been determined. Protests do not mean that a food should be eliminated from the diet or that efforts at cost control should be abandoned. Rather, it shows that some experimentation with other ways of preparing or combining foods may need to be sought. Careful storage of leftover foods and use of readily identified foods at a meal spaced at least a day away from the time of their first service is a recommended practice. Vegetables may reappear in soup, in casseroles, in combinations such as succotash, or in salads. Rice may reappear in rice custard, in a meat or fish curry, served with fruit, in soup, or in meat loaves. The appetizing use in the family's meals of *all* the foods one buys is the only way to get "the money's worth" out of the food allowance.

Satisfactions attained. The smooth and efficient management of food planning, preparation, and service in a home requires numerous skills in these areas; it requires insight into the relationships of one process with another, and of process with product. Its success or failure depends on the response that is given by the individual family. If the family members are well-nourished and healthy, satisfied and happy, well-mannered and friendly, there is proof enough that important goals of family life are being achieved by the effort.

ACTIVITIES

1. Five students, without previous discussion, each measure out what she believes to be standard portions of five foods, as corn, peas, string beans, apple sauce, and prunes. Determine the weight of the foods and record the data. Determine the average portion of each food and the range of difference in the size of the portions. Was there close agreement in the size of the portions?
2. Compute the cost of each of the above portions of foods at current market prices. What increase may be caused in the price per portion due to size of serving? How would this cost be modified in the process of food preparation?
3. Class participate in discussion led by a group of four or five class members on such subjects as:
   (*a*) Have families in your community clear cut goals toward which their efforts are directed?
   (*b*) What is spent per person per day for food?
   (*c*) What amount of time is spent on food preparation?

4. Working in groups, each group select some food preparation job and plan for the possible simplification of it according to the steps given on page 679.
5. Draft a plan of work for a food manager and one helper (both college age) for three meals, each for four persons, *one* to be prepared ready to serve in one-half hour; *one* for which the time allowance per meal is one hour, and the third, for which the time allotment is one and one-half hours. Note the difference in the meal plans, including foods served, the extent to which they were to be partially or wholly prepared outside the home, the effect, if any, which this might have on the charm and palatability of the proposed meal.

PROBLEM 7 *How shall meals be planned and prepared?*

One of the most interesting and challenging responsibilities of the homemaker is the planning of the meals for her family. Whether this is done well or poorly depends upon her education and attitude. Education should facilitate the selection and preparation of food which will maintain a high nutritional state. It should aid in developing desirable attitudes toward this responsibility.

Food needs

The first step in planning and preparing meals is to ascertain the daily food needs of the group. The energy requirement can be determined to a reasonably exact degree by totaling the estimated caloric needs of the individual members of the group. Thus, if the group is composed of father, mother, college daughter, and son of high-school age, the day's meal plans must furnish from 2500 to 4000 calories for the father, from 2000 to 2500 calories each for the mother and the college daughter, and 3000 to 4000 calories for the son. The total caloric requirement for the family would thus range from 9000 to 14,000 calories. If the group is composed of four college girls, the requirement would range from 8000 to 9000 calories. In such a group there may be some variation in individual need, although probably much less than in many other groups. The three meals of the day should be planned to meet the energy requirement of the group. A daily checking of the calories provided would be laborious and pointless, but an occasional evaluation of them is valuable, especially

for the novice, to whom the differing energy values of various foods may not seem real.

The meal should be planned so that individual needs may readily be met by varying the size of portions, by second servings, or by use of foods rich in calories as spreads or desserts. An additional glass of milk accompanied by a second heavily buttered slice of toast with jam may expand a breakfast adequate for the mother to one adequate for her growing son. The plans for each meal should be flexible enough to allow readily for such adjustment.

The next step is to determine that foods necessary to meet the body needs for protein, minerals, vitamins, and roughage are included. Guides offering an easy means for such checking have been given (Unit I, Problem 4). Their observation is as important in the planning of meals for the family as in the selection of food for oneself. Nutritionists recommend that the planning of the day's meals begin with consideration of the list of the Basic Seven foods and that provision be made first for these. After this is done the other foods are added as needed and desired.

Food costs

The food budget upon which meal plans should be based is determined by the family income, the number in the family, and their ages and activities. For families with an income of $4000 to $5000 per year, 30 to 40 per cent is considered about the desirable proportion to be expended for food at current prices. Families with lower incomes may have to use as much as 50 to 60 per cent, or even more. As the income increases, the percentage required for the food budget decreases. Computations based on the food budget are of two types, those that are made to determine the amount allowed "per person per day" and even per meal, and those that are made of the food expenditures among the various groups of food to ascertain the adequacy of the diet. The amount "per person per day" is determined by dividing the food allowance for the year by 365 and then dividing by the number of persons in the group. At this time (1956) sixty-five to seventy-five cents per person per day is low, eighty-five cents to one dollar is moderate, and over one dollar twenty-five cents is liberal as allowances for food prepared and served at home.

When the daily food allowance is known, the amount for each meal should be determined and the menu planned on this basis. The money expenditure for a given meal should be in keeping with the amount for the entire day's food. An undue expenditure for one meal will play havoc with the food plans for the rest of the day. For example, a division

for each meal on the basis of seventy-five cents would provide twenty cents for breakfast, twenty-five to thirty cents for luncheon, and twenty-five to thirty-five cents for dinner.

If a check of the day's menus reveals that the cost has well exceeded the food allowance, less expensive foods of similar value should be substituted. Seasonal fruits and vegetables, home-grown products, and less costly cuts of meat can be used. Margarine may replace butter. In some cases it may be necessary to replan and reorganize a particular menu and possibly those of the entire day in order to keep within the budget allotment. One way to be sure that the cost of the meal does not exceed the limits set is to compute the cost of each item and then determine the total of these. An occasional stock-taking of the total order may be helpful to the home-maker as a check on food expenditures. A suggested form for such accounting is given in Table 79. As many foods are used and often the amount is small, calculation of the cost should be made to two decimal places.

The dispersion of expenditures among the various groups of foods has been given much study, particularly in the lower income levels. The

TABLE 79. RECORD OF FOOD COSTS

Food	Amount	Cost per Unit	Cost for Amount Needed (4 persons)

following distribution is rather generally accepted for families with limited food expenditures:

One fifth more or less for milk and cheese.
One fifth more or less for fruit and vegetables.
One fifth more or less for meats, eggs, and fish.
One fifth or more for bread, cereals, and other starches.
One fifth or less for sugar, fats, and other groceries.

For example, if a family of four has a monthly food budget of $80, $16 to $18 should be spent for milk and cheese, the same for fruits and vegetables, and for meat, eggs, and fish, $16 to $18 for bread and cereals, and $10 to $16 for sugar, fats, and other groceries.

Another guide suggested to aid families with lower incomes in obtaining the essential foods in their diets follows:

Milk

One quart daily for each young child (to drink or in cooked food). Three fourths of a quart daily for each child over four (to drink or in cooked food). One pint for each adult (to drink or in cooked food).

Vegetables and fruit

From three to four servings per person daily. Eight to nine servings a week of potatoes and sweet potatoes (once a day, sometimes twice).

Two to three servings daily of tomatoes or of citrus fruits in season for each adult and child over four; four to six tablespoons of tomato juice or two tablespoons of orange juice daily for each child under four.

Five to six servings a week of leafy, green, or yellow vegetables.

Two to three servings a week of dried beans, peas, or peanuts.

One serving daily of fruit or an additional vegetable.

Eggs

Two to three a week for adults; four to five for young children; a few in cooking.

Meat or fish

Three to four times a week — more frequently if the meat dish is often a meat and cereal combination.

A cereal dish

Once a day, sometimes twice.

Bread

At every meal.

Desserts

About once a day if desired, such as cereal pudding, cookies, simple cake, shortcake, and inexpensive pastries and fruit.

Certain economies can well be practiced to obtain these necessary foods. If fresh whole milk costs more than the food allotment for it will cover, skim milk, evaporated milk, and dried milk, whole or skim, can be used instead. In making substitutions the following approximate equivalent food values should be kept in mind:

One quart fresh whole milk	Skim milk — 1 qt. + 1½ oz. butter or margarine
	Evaporated milk — 17 oz.
	Dried whole milk — 4½ oz.
	Dried skim milk — 3½ oz. + 1½ oz. of butter
	Cheddar cheese — 5 oz.

Courtesy of Evaporated Milk Association

Fig. 162

Cost — low; food value and appetite appeal — high.

Fruits and vegetables that are inexpensive should be chosen, and attention should be given to those in season. During the winter, grapefruit and oranges are usually low in price, and dried beans, cabbage, turnips, carrots, and many of the greens are nearly always inexpensive. Canned tomatoes can be obtained the year round and are always reasonable in price. The less expensive meats can also be purchased. Often the making of bread and cookies at home helps in extending the food allowance, just as does home preservation of food. Margarine takes the place of butter in many homes. Left-over foods can be used in various ways that are both pleasing and nutritious.

The food needed for a low-cost diet for one week for a family of two moderately active parents and two children, daughter fourteen and son eighteen, is as follows:

TABLE 80. ONE WEEK'S DIET FOR FAMILY OF FOUR

Fresh whole milk or its equivalent	17–21 quarts
Potatoes and sweet potatoes	13 pounds
Tomatoes and citrus fruits	5 pounds
Leafy, green, and yellow vegetables (Fresh vegetables as largely as possible)	14 pounds
Dried legumes and nuts	1½ pounds
Dried fruit	1 pound
Other vegetables and fruits	12 pounds
Eggs	1¼ dozen
Lean meat, poultry, fish	9 pounds
Flour, cereals (For each 3 pounds of baked foods, deduct 2 pounds of flour)	18 pounds
Sugar and other sweets, as syrup and preserves	4½ pounds
Butter or margarine	1¾ pounds
Other fats	2¼ pounds
Cheese	½ pound

Families with liberal or very liberal food allowances obviously will not increase their expenditures for all foods over those of the lower income families. More will be spent for fresh fruits and vegetables, milk, meat, eggs, and food accessories. The use of the highest grades and special packaged products is another way that the food expenditures are increased. The liberal or very liberal food allowance gives much leeway in choices and should make the problem of obtaining an adequate diet fairly simple.

Although food prices fluctuate in any locality and also vary substantially in different parts of the country, as a rule there tends to be a somewhat constant relationship among them. Below are examples of a day's menus for each of three different levels of food allowance.

Menu

Limited Food Allowance

Breakfast

Sliced Orange
Hot Whole-Wheat Cereal Top Milk
Toast Butter
Milk

One Half Grapefruit
Rolled Oats Top Milk
Toast Butter
Coffee

Luncheon

Cottage Cheese
Combination Vegetable Salad
Graham Muffins with Raisins Butter
Cocoa

Peanut Butter Sandwiches
(Brown and Orange Bread)
Cabbage Salad
Prune Whip and Lemon Sauce
Milk

Dinner

Tamale Pie
Lettuce and Carrot Salad
White Bread Butter
Rosy Apples
Coffee

Rice, Tomato, and Beef Stew
Baked Onions
Whole-Wheat Bread
Butter Jelly
Plain Custard

Moderate Food Allowance

Breakfast

Orange Juice
Cornflakes Top Milk
Scrambled Eggs
Buttered Toast Preserves
Cocoa

Luncheon

Meat Casserole
Endive Salad
Biscuits Marmalade Butter
Sliced Peaches with Cream Wafers

Dinner

Breaded Veal Cutlets
Creamed Carrots and Onions Buttered Zuccini Squash
Apple and Raisin Salad
Buttered Rolls
Cherry Upsidedown Cake
Coffee

Liberal Food Allowance

Breakfast

Raspberries Powdered Sugar
Puffed Wheat Cream
French Omelet Canadian Bacon
Date Muffins Butter Preserves
Cocoa

Luncheon

Curried Shrimp and Mushrooms on Toast
Raspberry and Grapefruit Salad
Butterscotch Nut Sundae   Wafers
Milk

Dinner

Consommé
Leg of Lamb
Parsleyed New Potatoes   Buttered Peas
Raw Spinach Salad
Finger Rolls   Preserves
Fresh Blueberry Pie
Coffee

Rules for planning meals

The difficulty in selecting foods that combine to make desirable menus will be greatly lessened by observation of certain rules for meal planning.

The following helpful rules have been formulated:

1. Select food that meets the nutritional needs of those for whom the meal is planned, using the "Basic Seven" food list as a basis.
2. Consider food for each meal in relation to food plans for the day.
3. Keep the food value of any given meal essentially the same, day after day.
4. Select food suitable for the meal.
5. Consider the personal likes and dislikes of the group.
6. Select foods that combine pleasingly.
7. Have contrast in the food.
8. Have daily variety.
9. As a rule, select food in season.
10. Avoid serving more than two dishes of concentrated food in any one meal.
11. Select food that is readily prepared.
12. Select food that is easily served.
13. Select foods after due consideration of the equipment on hand.
14. Consider the cost in relation to that to be spent for food for the day.

Menu forms

To facilitate both the planning of the individual meal and the meals for the week, a record of the menus chosen should be made. In the customary manner of writing menus, foods are listed in the order served, and those eaten together are grouped together. All words except prepositions and conjunctions should be capitalized. The words are spaced to give a balanced appearance to the menu. A breakfast menu would appear thus:

Orange and Tangerine Sections
Cracked Wheat with Whole Milk
Bacon Curls
Toast Butter
Cocoa

A luncheon menu would be written as follows:

Cheese Fondue
Buttered Green Beans Carrot Strips
Rolls Butter
Greengage Plums Plain Cake
Milk

A dinner menu would be written as follows:

Loganberry Juice–Ginger Ale Cocktail
Baked Fresh Ham Rissole Potatoes
Creamed Cucumbers
Raw Cauliflower–Carrot Salad
Chocolate Roll

The preparation

Though much of our procedure in food preparation remains traditional, research and investigation are increasingly developing a scientific basis for it. Through such work, common practices in food preparation are being either explained, sustained, or condemned and revised. Methods of good preparation procedures are becoming standardized and consistently produce high quality products. By the use of such methods, meal preparation is simplified. Sometimes there are two or more satisfactory methods. The problem then becomes a choice between or among them. A method having been chosen, it should be followed, with deviations only for good reasons. Thus a habit is formed that makes for ease and efficiency in performance and for assurance of a satisfactory product. These methods of procedure are usually expressed as recipes, which are, in fact, formulas giving the proportions of ingredients to be used, the method of combining, and the cooking processes involved.

Standard or basic recipes express for a whole group of dishes, such as batters, the general proportions and procedures to be followed, and further indicate possible changes in the product by variation. Familiarity with basic recipes and standard proportions, like an understanding of standard products, is fundamental in satisfactory meal preparation. Only as each separate dish measures up to the accepted standards for that product is the success of the meal assured. The problem in meal preparation becomes, then, one of choosing and following tested preparation procedures

in such sequence that at a set time all the food will be ready and most palatable.

Time required for preparation

Quite as important as the money expenditure is the time expenditure in food preparation. Various studies indicate that the average time spent in activities related to food in different homes is from three to three and one half hours daily. Doubtless not all of the time spent is necessary. The efficiency of the worker and the carefulness of planning affect the time required for a given task. In most households there are limits to the amount of time that can be given to food preparation, and these should be expressed in the meal planning. If the homemaker has but thirty minutes to prepare a meal, she should plan a meal that requires only that amount of time. If she hopes to be a serene hostess, she will not plan too many things to be done at the last minute. If she is to be at home most of the day, she can plan a menu that can be prepared at different periods during the day rather than just before the hour for the meal. A meal that can be prepared in twenty minutes is different in many respects from the one that requires two or three hours.

The use of menus which require but a short time to prepare is becoming increasingly popular. Homemakers are interested in having time for numerous other activities. If a homemaker is using more than one half or two thirds of her time in preparing meals it is doubtful if her plan of work is well balanced.

Below are listed some menus for meals to serve four to six persons, with the time required for their preparation.

Breakfast

15 Minutes
Frosted or Fresh Blueberries Cream
Toast Butter
Milk

45 Minutes
Orange Juice
Cornflakes Cream
French Omelet
Muffins Butter Jam
Coffee

Luncheon

25 Minutes
Creamed Tuna on Toast
Head Lettuce Salad
Ambrosia
Vanilla Wafers
Cocoa

1 Hour and 30 Minutes
Fruit Cup
Egg Timbales with Cheese Sauce
Buttered Broccoli
Stuffed Tomato Salad
Hot Biscuits Butter
Apple Tapioca
Milk

Dinner

60 Minutes
Honeydew Melon with Lemon
Broiled Club Steaks
Baked Potatoes Creamed Asparagus
Cabbage-Celery-Green-Pepper Salad
Whole-Wheat Bread Butter
Canned Plums Icebox Cookies
Coffee

3 Hours
Assorted Canapés
Roast Chicken Dressing
Mashed Potatoes Gravy
Fresh Green Beans with
Hollandaise Sauce
Pineapple Relish Salad
Hot Rolls Butter
Individual Cherry Pies
Coffee

Plan of work

Plans for preparing the food are made in relation to the time set for serving the meal. Nothing that can be done earlier in the schedule should be left until the last minute, and no foods that are injured by standing should be prepared earlier than necessary. Time sequence should be studied, and when once decided upon should be followed. If dinner is at 6:30, potatoes to be baked must be put into the oven at 5:30 and Swiss steak started at 4:45, and a frozen icebox dessert should have been made several hours before. Recipes, table appointments, and equipment needed should all be considered in planning the procedure.

A person unaccustomed to planning for meal preparation will find the following steps helpful in formulating a workable plan. First, determine all of the activities that are necessary in preparing the meal; second, determine the sequence in which these should be carried out; third, list those activities in sequence as a plan of work and place this plan in the kitchen where it may be easily seen. A typical plan of this order follows:

Breakfast Served at 7:30

Orange Juice
Bran Flakes Cream
Scrambled Eggs
Graham Muffins Butter Jelly
Coffee

Time	Task to Be Done
Some time day before	Check to make sure all supplies are on hand.
6:45	Light oven.
6:48	Prepare orange juice and set to chill.
6:55	Prepare muffins.
7:05	Put muffins in oven to bake.

7:07	Set table and place bran flakes, cream, sugar, butter, and jelly on the table.
7:15	Put coffee on to percolate. (Remove from fire when done.)
7:20	Prepare eggs and cook.
7:27	Place food in serving dishes.
7:30	Serve breakfast.

Dinner Served at 6:30

Menu

Broiled Hamburger Creamed Potatoes
Buttered Cabbage
Tomato and Lettuce Salad
Bread Butter
Rhubarb Sauce Cookies
Coffee

Time	Task to Be Done
Some time before	Make, and bake cookies.
5:30	Cook and chill rhubarb and prepare salad dressing.
5:38	Wash lettuce; peel and slice tomatoes. Chill.
5:45	Peel potatoes, and start to cook.
5:50	Shape meat balls, and set in refrigerator. Set table, warm dishes and serving dishes. Cut butter.
6:00	Make white sauce. Start water to heat for coffee.
6:10	Clean and shred cabbage, and start to cook.
6:15	Prepare ice water.
6:18	Start meat to panbroil.
6:20	Combine potatoes and white sauce.
6:23	Arrange salad on plates; add dressing. Place on table.
6:25	Start coffee. Place butter and bread on table, and pour ice water.
6:28	Arrange meat, potatoes, and cabbage in serving dishes.
6:30	Serve dinner.

Dinner Served at 6:30

Menu

Spanish Steak Baked Potatoes
Buttered Dandelion Greens
Carrot and Apple Salad
Bread Butter
Chocolate Blanc Mange
with
Whipped Cream

Time	Task to Be Done
Some time before	Check to see that all supplies are on hand.
	Make salad dressing.
4:45	Start oven.
	Pound steak and sear.
	Add vegetables, seasonings, and put steak in oven to cook.
	Make blanc mange, mold and set to chill.
5:20	Wash potatoes.
5:30	Put potatoes in oven.
5:32	Wash greens and set in cool place.
5:45	Set table.
6:00	Wash ingredients for salad, and scrape carrots.
6:05	Prepare ice water, and cut butter.
6:08	Whip cream and set in refrigerator.
6:10	Finish preparing and combine salad ingredients.
	Arrange on plates.
6:15	Put greens on to cook.
6:18	Put salad, butter, bread, and water on table.
6:23	Season greens.
6:25	Put steak, potatoes, and greens in serving dishes.
6:30	Serve dinner.

Sometimes the novice finds her sense of adequacy and assurance increased and time saved by the inclusion of recipes and methods in the written meal plan. However, details of this order soon become unnecessary. Eventually the whole procedure of meal preparation becomes so routine that the experienced homemaker rarely formulates any of it in writing.

If two or more persons are preparing the meal, the plan should be made in relation to the additional service at hand. Many have found it helpful to outline the duties of each person in order that the work can proceed efficiently. Co-operation and team work are essential.

V. *Requirements for meal plans and procedures*

1. The following should be included at least once in the meals planned: hot bread, made dessert, hot beverage, fresh fruit prepared in some way, cooked vegetable, and all "make-up" foods of which the preparation was missed in previous class periods.

2. Canned vegetables and fruits may not be served unless used in a prepared dish. Fresh vegetable cookery is encouraged and preferred.

3. Canned fruit or vegetable juice may not be served in place of prepared fresh fruit.

4. All foods served in class meals are included in menu plans and costs. Food may not be brought from home or elsewhere and used in the meals.

5. One and one-half hours are allowed for preparation of the meal.

6. At the end of the three-hour class period, the meal must be over and the kitchen in order for leaving.

7. Trays and all leftover foods are returned to the storeroom immediately after meal is served. Extra utensils are returned when dishes are washed, before or after meal.

VI. *Organization of market order*

Recipe	Foods needed	Amount	Unit cost	Totals	Cost of each recipe
Fruit	Grapefruit (sectioned)	3	.05	.15	
	MM cherries	2	.004	.008	.158
Main Dish (scrambled eggs)	Eggs	6	.03	.18	
	Bacon	4 sl.	.025	.10	
	Milk	⅓ c.	.03	.01	.29
Repeat for all other foods used.					

Total cost of Meal ____________

Market Order for Meal

Hostess
Host

Meal
Date and Time
Kitchen-dinette

MENU

FOOD LIST

Food	Amount	Unit Cost	Total Cost
Incidentals (storeroom charges)			.03

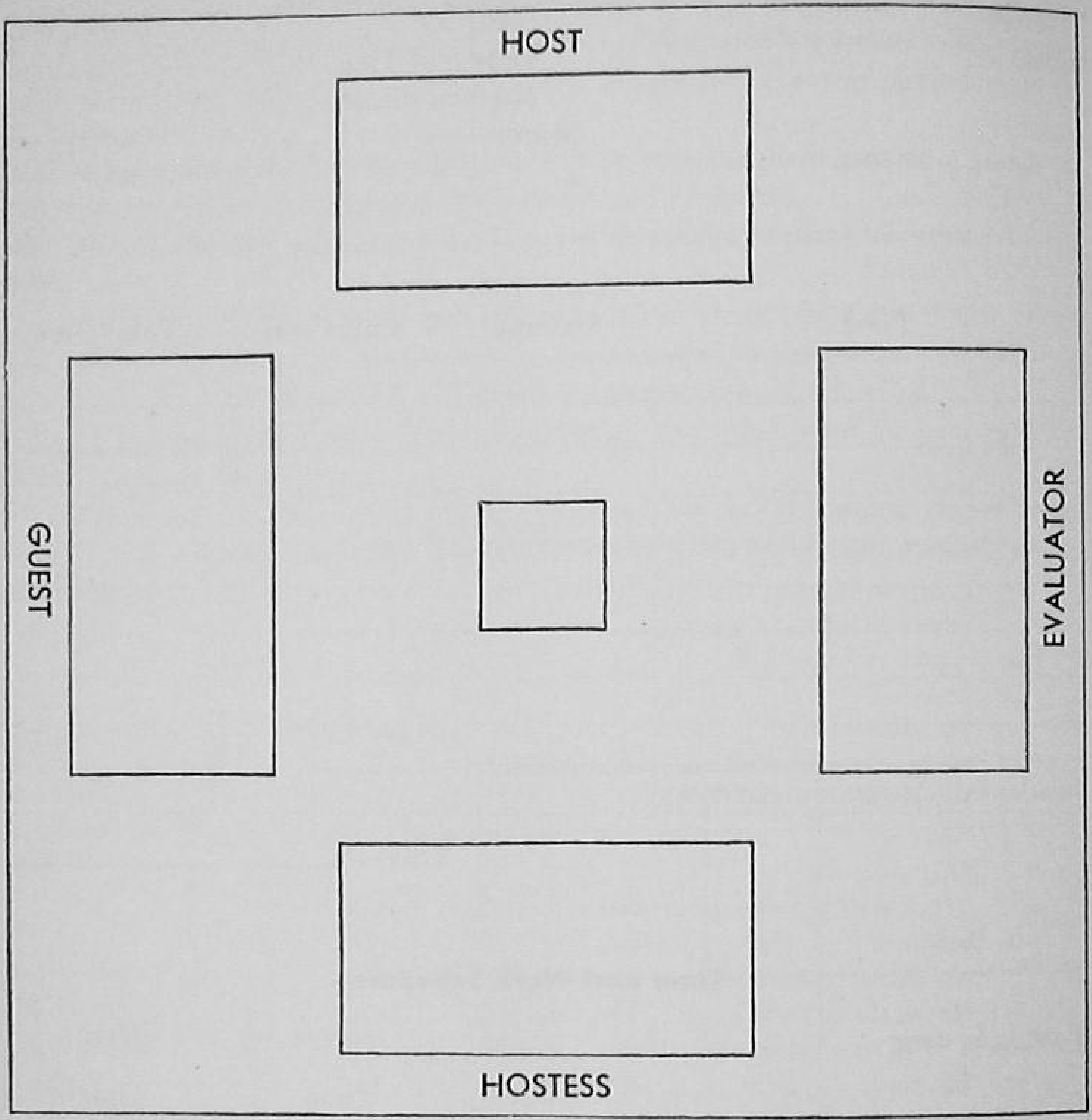
Total ____________

Time and Work Schedule

Task to be done	*Hostess* Time	*Host* Time

Table Arrangement

Table Diagram of ____________ Meal ____________



1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....
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11. ....
12. ....
13. ....
14. ....
15. ....
16. ....
17. ....

MENU

18. ....
19. ....
20. ....
21. ....
22. ....

Write names of table appointments to be used and foods to be served by the above numbers and use these numbers on "table" to indicate placement.

TABLE 81. SCORE SHEET FOR MEALS

Hostess.............................. Host..............................

Meal............ Date............. Evaluator..........................

Possible score — 168

A. Selection of food
   1. Balance
      Different foodstuffs represented..................
   2. Texture
      Contrasting..................................
   3. Flavor
      Contrasting..................................
      Palatable....................................
   4. Color
      Colorful.....................................
      Harmonizing..................................
   5. Adaptation
      Foods in season..............................
      Foods suitable to meal.......................

B. Preparation of food
   1. Cooking
      Suitable method..............................
      Neither overcooked nor undercooked.............
   2. Seasoning
      Pleasing.....................................
   3. Organization
      Work well planned (Instructor scores)..............
   4. Economy
      No waste of time (Instructor scores)...............
      No waste of food.............................

C. Service of food — Hostess
   1. Punctual
      Ready at time set............................
   2. Appearance
      Table neat, attractive, and correctly laid..........
      Food inviting................................
   3. Quietness
      No rattling of silver and dishes...................
   4. Correctness
      According to standards set......................
   5. Skill
      Quickly and easily done........................

D. Service of food — Host
   1. Correctness
      According to standards set......................
   2. Skill
      Quickly and easily done........................

Use key (put in number which corresponds to quality)
1. Very poor
2. Poor
3. Fair
4. Satisfactory
5. Good
6. Superior

Comments:

E. Handling of silver in serving and eating
   1. Hostess handles silver correctly....................
   2. Host handles silver correctly......................
F. Atmosphere
   1. Hostess pleasing and at ease....................
   2. Host pleasing and at ease.......................
G. Conversation
   1. Hostess guides talk pleasingly...................
   2. Host participates...............................
   Total score.................

PROBLEM 8 *What are accepted procedures in meal service?*

The service for any meal should be as attractive, convenient, and efficient as possible under the existing conditions. Even though time for meal preparation and service is limited and table appointments are simple, plain, and easily kept in order, the service should be done with ease and skill.

The service should always be in keeping with the menu, the table appointments, and the equipment on hand. The available help, whether hired or contributed by members of the family, should be considered. Elaborate service that requires a large expenditure of time and energy on the part of the homemaker herself may be a questionable investment in ritual. Elaborate service for a simple meal is quite out of place and only serves to intensify the plainness of the meal. A breakfast of prunes, toast, and coffee scarcely requires that one member of the family be detailed to serve it, or that the food be separated into portions and served by the host at the table. On the other hand, a three-course luncheon for twelve or fifteen people requires detailed and careful planning, and could not easily be served by the hostess alone.

For most groups an informal service is most convenient and desirable for regular use. The tendency in most families is to adopt some suitable form of service that through regular use becomes accepted as a family ritual in which all members share. It thus gains a characteristic and pleasing note that both family and guests enjoy.

Breakfast service

In all households today, it is generally found that breakfast is the most informal meal, both in the dishes included and the service used. This was not always the case. Formerly it was a meal at which every member of the family was present. Infants, children, and adults all gathered about the table, and after the meal, morning devotions often followed. No one was excused from the breakfast table. The early hour, the hearty meal essential to the vigorous work ahead, together with the association of the meal with the religious rites of the family, all exerted an influence on the form and type of service used. Breakfast was, in fact, the formal opening of the day for the family. With changes in habits of living in recent years, there has come a marked difference in breakfast customs. Even in the rural districts, breakfast is no longer served at an extremely early hour. Infants and young children are encouraged to sleep longer and adult members of the family adjust their rising hour to their work. Family devotions, if observed, find their place in the evening. The light work engaged in by members of many families has led to simplified breakfast menus. With less food to be served, fewer people to partake of it, and no rite to be observed, the meal has tended to become distinctly informal. To permit the freedom now characteristic of our informal breakfast, and yet to give the satisfaction of a well-served meal, is a problem of the modern home.

Luncheon or supper service

Luncheon or supper is usually a less informal meal than breakfast. As a rule, a greater variety of food is served. The service is slightly more complicated, and the table appointments may be less simple.

There is considerable variation in the type of luncheon or supper served in homes throughout the country. The meal may be light, medium, or heavy, each requiring a different method of service. In some families only the mother and children are present at the noon hour, the wage earner eating away from home. In others, some of the children have their lunch at school, and only the adults and young children have luncheon at home.

Breakfast and luncheon are both likely to be hurried. Hence the plans for the service of these meals should be adapted to the time available. This does not preclude observations of accepted table manners and common courtesy, but it does require that the active participation of each member be greater.

Dinner service

Dinner is usually the most formal meal of the day. Whether served at

noon or in the evening, theoretically the entire family is present, and the meal is served in a more leisurely fashion than are the others. The service, no matter what type, is a little more elaborate than that for the other meals because there may be more courses and, also, more food to be served. As it is a time of meeting for the family, its service should add to their pleasure and social life.

Forms and styles of table service

The forms of table service are divided into two general classes, informal and formal. Informal service includes those forms in which the host, hostess, and other members of the group, as well as the waitress or waiter, may participate. It is friendly, gracious, and simple. Formal service is that form in which the waitress or waiter alone participates, the host and hostess having no part other than watching to see that the procedure goes smoothly. It is dignified, elegant, and elaborate and has no place in the servantless home. Family, English, compromise, and buffet styles are all types of informal service; the Russian style is formal. The terms English and Russian here designate specific styles of service, not necessarily those in general use in the country from which the name is derived.

Family style service is that used when the entire meal or the main part of it is placed on the table at one time and served and passed by the persons at the table. The plates are placed at the individual covers and much of the food is on the table before the family is seated. Sometimes the dessert is brought from the kitchen by a member of the family at the time of its service, but it, too, may be served and passed at the table. Soup, hot beverages, and cereal are usually placed on the table just before the meal is ready. Family service is widely used in many homes. This is no doubt because it is simple in form and requires less time and effort.

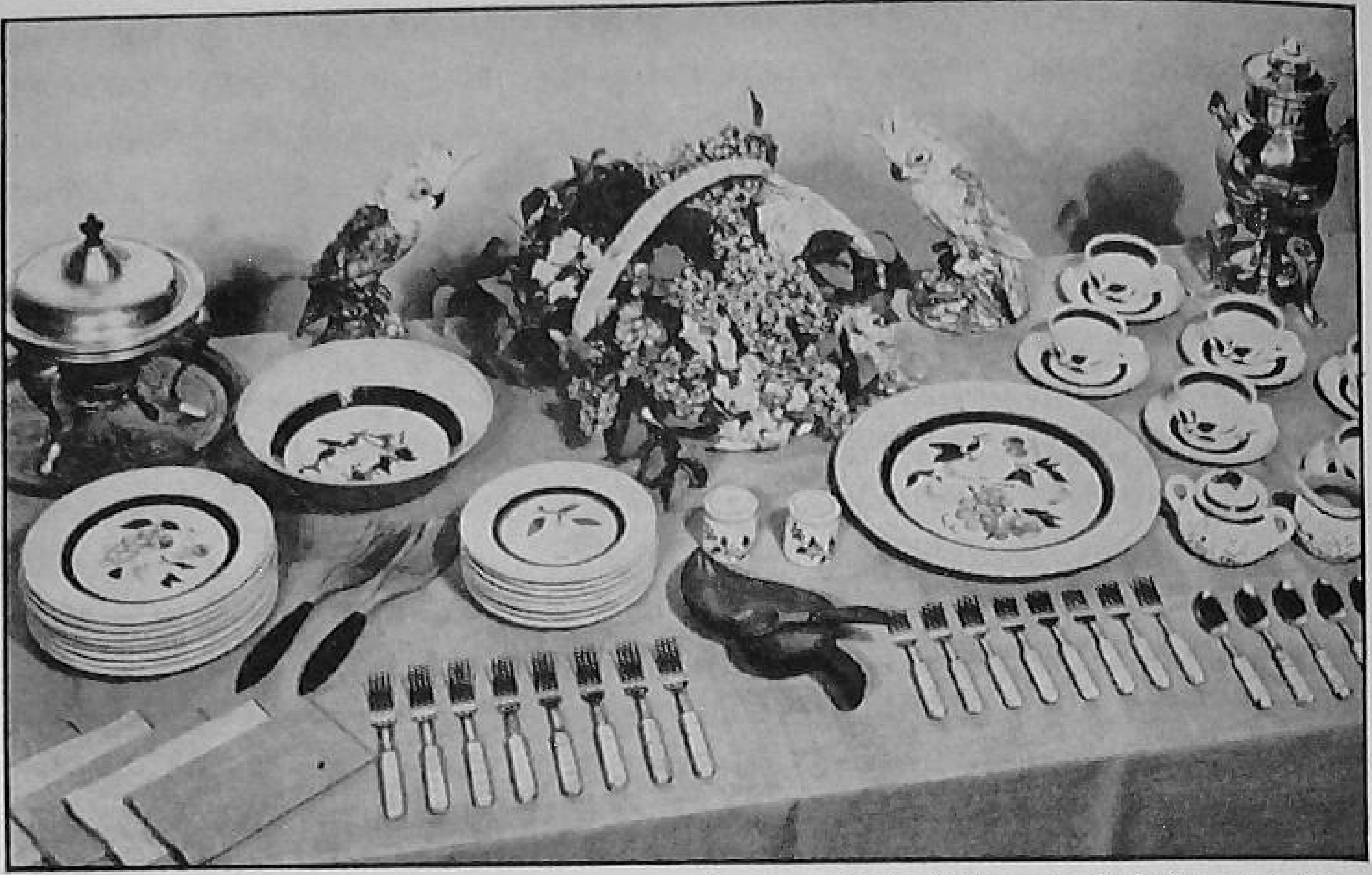
English service is the style in which all food is served at the table by the host and hostess and other members of the family. It is a pleasing and hospitable form of service. The host carves the meat and serves the plates. He may also serve part or all of the vegetables, but frequently the plates are passed to the hostess or to some member of the family seated next to the host who may serve these. The hostess serves the beverage and the dessert. She also serves the salad or designates some other member of the group to do so. One course is served at a time and is removed before the next course is brought in. English service may be carried on with or without waitress or waiter. If there is a waitress, she brings all plates and dishes to the guests after the food has been put on them. She also passes all accompaniments of the course and removes the plates and

other dishes when the course is finished. If there is no waitress, the plates and other dishes and accompaniments are passed by those at the table. The dishes are removed and the food for the next course is brought in by the hostess or other member of the group.

Compromise service is a combination of the English and Russian styles. It is convenient and well adapted for both family and guest meals. Some of the foods are served at the table and others from the kitchen. It is suitable for any meal and may be served with or without a waitress. The choice in regard to the food that will be served at the table or from the kitchen depends chiefly upon the menu and the facilities available. The service of the foods is divided among the host, hostess, and others at the table and the placing, passing, and removal of dishes is done in the English style according to whether or not there is a waitress.

Buffet service in a way is a form of compromise service. The food and tableware are attractively arranged on the table, buffet, and serving table, and the guests are served from these. Usually the serving is done by friends of the hostess who are seated at the table, although some or all of the food may be served by the guests themselves. Sometimes the food is served entirely from the kitchen, and only the tableware and meal accompaniments are served from the table or buffet. Part of the food may be served from the table and part from the kitchen. The dessert frequently is served from the kitchen directly to each guest. The used dishes are removed by a waitress or assisting friends. In an extremely informal meal, the guests themselves sometimes help remove the dishes. Occasionally a buffet meal is more formal. In this case waiters or waitresses serve the filled plates, beverage, and accompaniments and remove the soiled dishes. Guests may stand while eating, but it is usually the custom to provide chairs arranged informally in the living room. Often small tables are placed for the convenience of the guests. Buffet service is desirable when more guests are present than can be seated conveniently at the table. Guest luncheons and suppers are the meals for which this service is commonly used. Wedding breakfasts are frequently served buffet style, though often as formally as this method of serving permits.

Russian style is the most formal and elaborate form of table service. It is less used in the home than the other forms, but is most attractive when well executed. Its principal use is for formal dinners and luncheons. However, any meal can be served Russian style. Hotels, restaurants, and tearooms use this type of service with various modifications and adaptations. In Russian service, the food is all served from the kitchen, and requires adequate waiter or waitress service. The food may be ar-



Courtesy of John Falkner Arndt & Company, Inc.

Fig. 163

Table set for a buffet meal

ranged on the individual plates or dishes and placed before each guest by the waitress; or it may be placed in suitable serving dishes and passed by the waitress to the individual guests who serve themselves or are served by the waitress.

In a formal meal, only Russian service is used. Goblets and service plates are always used, and place cards if desired. No food appears on the table until the guests are seated. Butter is not served. Salt and pepper may or may not be served, as the hostess desires. Dessert silver is placed just before the dessert is served. Finger bowls are a part of the formal meal, and coffee without cream is served as a separate and last course. A formal meal should not be undertaken without adequate and well-trained help. At least one waitress or waiter is needed for every six guests. Semiformal meals are more frequently served than strictly formal meals. In the service of such meals, the general pattern of Russian service is followed with modifications and variations made according to the situation.

General rules for setting the table

Dust the table; then lay the silence cloth or board, making it perfectly

smooth and fastening it, if necessary, to hold it in position. Lay the tablecloth carefully with the middle, lengthwise crease up and exactly centered. Smooth out any wrinkles in the cloth. The tablecloth should extend over the table an equal distance at each end, preferably ten to sixteen inches. When place mats and table runners are used, no silence cloth is needed. Place the decoration, if there is one, in the center of the table.

The "cover" is the term used to indicate the place set for each person at the table. This includes the flatware — nearly always referred to as silverware or silver — china, napkin, and glass for each person's use. Allow twenty to thirty inches for each cover in order to provide sufficient space for each person. When there is an even number of people at the table, the covers should be directly opposite each other.

If plates are placed at this time, they should occupy the center of the cover and be one inch from the edge of the table. Place the silver beside the plate, one inch from the table edge and perpendicular to it. Lay the silver close to the plate but do not crowd.

Place the knife, sharp edge in, to the right of the plate; the fork, tines up, to the left of the plate; the spoon, bowl up, to the right of the knife. Place salad and dessert forks to the left of the first fork. If a cocktail fork or an oyster fork is used it is placed to the right or on the service plate. Additional spoons are placed to the right of the first spoon. Forks and spoons may be arranged in the order of their use in the meal, beginning from the outside. Some prefer to place the main fork next to the plate, arranging the others in the order in which they are to be used. Or, if desired, the silver may be arranged in order of size. If butter spreaders are used and the knife is not needed, it may be omitted. The fork or forks are then placed at the right where the knife customarily is placed. A salad fork is not necessarily used in the informal meal in which the salad is not served as a separate course. In the formal meal, and sometimes in the informal meal served in courses, some of the silver is placed as a course is served. The silver for dessert and after-dinner coffee is frequently so placed.

Put each piece of serving silver at a convenient place adjacent to the dish with which it is to be used, following the general line of the other silver on the table — that is, parallel and perpendicular to the edge of the table. Provide service silver for all serving dishes. Lay the necessary pieces beside the dish. If but one is required, place it to the right of the dish; if two are needed — for instance, a knife and fork or a fork and spoon — place the knife or spoon to the right and the fork to the left of the dish. Do not put the individual silver into the serving dishes.

At the left of the fork and in line with the silver, place the napkin, neatly folded, with the loose corner at lower right toward the plate or with the fold to the side of the plate. The folded napkin may also be placed in the center of the cover. In a formal meal the folded napkin is placed in the center of the service plate unless the first course is placed before the guests are seated. At a family meal the napkin may be held by a ring or other device.

Place the water glass at the tip of the knife and slightly to the right of it. As coffee or tea cups are served and passed, place the cup at the right of the spoons with the handle parallel to the edge of the table and on a line that passes slightly below the center of the plate. If milk is served, place it at the right of the water glass.

Place salt and pepper shakers in convenient places, spacing them uniformly. One set for every two or three persons is desirable. If individual salt and pepper shakers are used, these should be placed directly in front of the cover. Place the sugar bowl and cream pitcher directly in front of the hostess, the sugar to the right and cream to the left, with handles of both following the same line, preferably lengthwise of the table.

Place bread-and-butter plates, when used, at the tip of the fork slightly to the left. The butter spreader is placed across the top of the plate, cutting edge toward the center of the plate. Or, if preferred, it may be placed on the right side of the bread-and-butter plate parallel with the other silver of the cover.

Serving silver to be used by the host should be placed by the serving dish if the dish is set in front of host's cover, but with the host's silver if the dish is at the side of the host's cover.

A serving table or tea cart is often used to save steps and facilitate service of the meal. It should be located near the dining table and convenient to the kitchen. It may have a cloth or doily on it, or it may be left bare, as preferred. Such articles may be placed on the serving table, as water and milk pitchers, coffee or tea service, extra pieces of silver, and sometimes food for another course, such as salad or dessert. Space may also be left for the exchange of dishes between courses.

General rules for serving (informal service)

Provide warm dishes for hot foods and chilled dishes for cold foods. Serve hot foods hot and cold foods cold. Put ice in the water glasses, if desired, and fill them three fourths full of cold water just before the meal begins. Refill the pitcher and place it conveniently near the member of the family who is responsible for refilling the glasses as needed.

If bread is served, cut in half slices lengthwise, or in smaller slices if the loaf is large, and arrange them carefully on a plate. Place bread, butter, jelly, and other cold foods on the table shortly before the meal is served.

Immediately before serving, place hot foods conveniently near the person who is responsible for the serving or passing. If the beverage is served with the main part of the meal, its service accompanies that of the other hot foods. It may be served from the kitchen or at the table. Beverage cups should be filled three fourths full. If the beverage is served at the table, place the pot near the one who is to serve it, with the handle of the pot parallel to the edge of the table at a distance convenient for grasping. It is preferable to place each cup in its own saucer with the handle slightly toward the right. When space does not permit of this, two cups may be stacked together. The cup is placed on the saucer, and after being filled is passed with the handle toward the right. Cream and sugar, if used should be put in the cups before the beverage is poured. Each person should be asked whether he prefers cream, sugar, or both.

Arrange the food in a uniform manner on the plates, for example, the meat on lower left side of plate with potatoes on upper left and other vegetable on right side of plate. Plates should be passed or placed uniformly so that each cover appears the same.

Make sure that everything is assembled before announcing the meal. If the food is to be passed at the table, a uniform plan should be followed. When starting to pass a food, place any necessary serving silver at a convenient angle on the dish. Do not help yourself first unless you are especially requested to do so.

As a general rule, food is passed to the right. Receive the dish with the right hand and transfer to the left, serving yourself with the right. Then, with your left hand, offer the article to the next person on your right, with the handle, if there is one, turned toward the person receiving it. Take care that your fingers do not come over the edge. Pitchers and similar articles which are held in the right hand for serving are transferred to the left for passing.

Details of service

The chief responsibility of the waitress, whether she is the hostess, other family member, or an employee, is to see that the service of the meal is as orderly, prompt, inconspicuous, and delightful as she can make it. Her movements should be quick, quiet, and skillful. She should meet any emergency that arises coolly, quickly, and quietly. Before the meal is served her responsibilities are as follows:

See that dining room is comfortable in regard to ventilation and heat.

Lay the cloth, arrange the decorations, set the table, and place the chairs.

See that suitable dishes and silver are in readiness for each course.

See that food and dishes are of proper temperature.

See that food is arranged properly upon the dishes.

Have everything in readiness when the meal is announced. A meal is announced to or by the hostess thus: "Dinner is served."

In the service of the food, the following are generally accepted procedures:

When removing a dish and placing another at the same time, remove with the right hand and place with the left hand. In all other cases, place and remove from the left side with the left hand except dishes that are on the right side of the cover, such as water glasses, ices, and beverage cups. Place and remove these at the right side, with the right hand.

When a guest is to serve himself, offer food from the left side with the left hand. In presenting dishes of food, place a service napkin on the palm of the hand to protect it from heat and contact with food. The service napkin is used only under dishes containing food. Offer the food at a height, distance, and angle convenient for the person being served. Silver for serving should be placed conveniently.

When refilling glasses, do not lift them from the table. If possible, fill without moving glasses from their place; otherwise move glasses to the edge of the table, grasping them near the bottom. Use a service napkin to catch the drip from the pitcher.

Repass bread or rolls and butter as needed.

In placing, passing, or removing several small articles and extra pieces of flat silver, use a small tray covered with a doily or tray cloth.

Place a side dish on the side to which it belongs, for example, a salad to the left of the cover in a main course, and an ice at the top of the main plate or to the right as preferred. Salad may be placed at the right if desired, in which case no other dish, such as an ice or beverage, is on that side.

Before the next course, clear the table in the following order: serving silver and dishes, used plates and silver, and any unused china and silver provided for the course. If desired, bread-and-butter plates may be left upon the table until after the salad course. If an informal meal is being served, two dishes from a cover may be removed at once, as for example, course plate left hand, left side, transfer to right hand and bread-and-butter plate left hand, left side; or salad left hand, left side, and then ice right hand, right side.

Before placing dessert, remove all dishes, both serving and individual. Crumb the table with a small folded napkin and a plate or crumb tray. Crumb each cover with the open edges of the napkin left side, left hand, in the order in which the guests are served.

If more than one waitress is employed, such duties as caring for the dining room and work counters in the kitchen, caring for the table dishes and preparing salads, sandwiches, beverages, fruit relishes, and servings of butter are added to the serving of the meals.

Coffee and tea service

The hours popular for morning coffees are from nine to eleven o'clock, those for afternoon coffees and teas are from three to six. These may be formal or informal, and the latter may have many variations in degree of informality. There may be many guests or few. The menu and its service should be in keeping with the type of event and the character and size of the group being served. If only a few guests are present, the hostess pours, but if a number are entertained, a friend pours for her. In the case

Courtesy of Grande Maison de Blanc

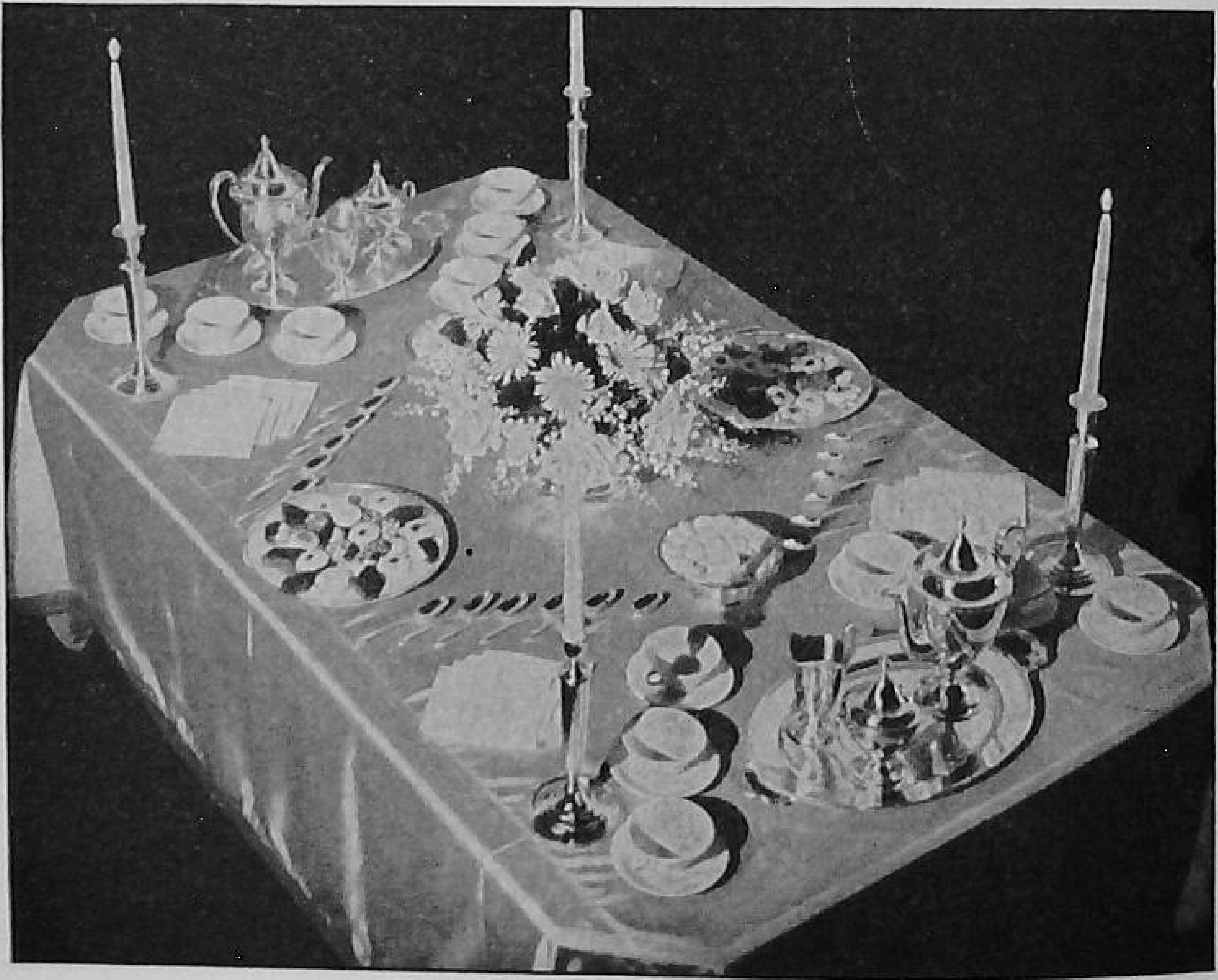
Fig. 164

An informal tea table is informal in its appointments and their arrangement.

of an extremely large event two people should pour, and a large table should be used.

For very small groups, a large tray, tea wagon, or small tea table may be set up with the coffee or tea service and the food. These are arranged in an attractive manner and are excellent for the extremely informal affair. For large groups the regular dining-room table or a special coffee or tea table is used.

The table is arranged like that in the buffet service (page 703). It should be made as lovely and artistic as possible. Flowers, candles during the winter season, and other decorations are used. An attractive tea cloth and napkins are much to be desired, as are good china and silverware. A coffee or tea service of some type is essential. Frequently these are of silver, but many attractive ones of other metals, earthenware and semi-porcelain are now available at reasonable prices.



Courtesy of Better Homes and Garden

Fig. 165

A formal tea requires a formal table setting.

The food served at a coffee or tea is light and dainty and of such nature that it can be easily eaten without soiling the fingers. The menu generally consists of coffee or tea, or other beverages, and its accompaniments, fancy sandwiches, cakes, nuts, and candies. Sometimes an ice and sandwiches, fancy crackers, or cake are served. In warm weather an iced beverage is often served instead of a hot one. Hot biscuits or rolls and jam are sometimes substituted for sandwiches, especially for a small informal occasion. Fancy wafers or crackers, cinnamon toast, cheese straws, tiny éclairs, candied fruits, and similar foods are all popular for teas.

Courtesy of Pan-American Coffee Bureau

Fig. 166

Coffee graces this informal setting.

At informal coffees or teas the hostess usually invites the guests to go to the table where they are served with the beverage. They then help themselves to the other foods on the table, napkins, and silver, and stand or sit, depending upon the arrangements. After finishing their food, the guests place their used plates in some convenient place unless these are removed by the hostess or her assistants.

At formal coffees or teas the guests are invited to the dining room by assistants of the hostess. The plates may be served with a filled cup, a spoon, and accompaniments, or the latter may be passed. After the guests have finished, the plates are removed by assistants, and the guests leave the dining room.

Brunch service

Brunch is a meal that is a combination of breakfast and luncheon and is very popular in many localities. Served around 11 A.M., it is mostly a Sunday, holiday or guest meal. The foods that make up a menu for brunch are among those often served at breakfast and luncheon. Included are such foods as eggs, bacon, corned beef hash, creamed chicken or chipped beef, sliced tomatoes, hot breads, waffles, jelly, jam, honey, fruit, melon, and beverages. Being an informal meal, an informal type of service

is followed which may be family style, buffet or even some type of party service.

Outdoor meal service

Eating outdoors is a regular part of American living today, especially during the warm months of the year. Any meal may be eaten outdoors though the evening meal is perhaps the most favored one for this purpose. Whether eaten at home on the porch or in a back yard, or in some lovely spot miles away, many people find outdoor meals a great source of enjoyment.

The food for these meals may be prepared in the home kitchen or part of the food may be prepared inside and the rest outside. Some people even like to prepare all of the food outdoors. A wide variety of types of equipment is available for outdoor cooking and a certain amount is neces-

Fig. 167

What could be more fun than a meal like this?

Courtesy of Ralston Purina

Fig. 168

Party refreshments are often simple. Even so, they may be interesting, attractive, and pleasing.

sary if this is done efficiently and appealingly. Included are brick or stone fireplaces, portable barbecue grills and rotisseries, portable ice boxes or refrigerators, wire racks, coffee pots, skillets, and kettles. Long-handled spoons, forks and tongs, shears, can and bottle openers and sharp knives of different sizes and types are some of the musts in small equipment. Paper and plastic table appointments are used and dish washing is kept to a minimum. Menu plans follow the same general pattern for indoor meals except that foods and recipes easily prepared and served outdoors are chosen. If the food is to be transported some distance, that which is easy to carry and keep in good condition is an important consideration.

The service of outdoor meals is informal and most always very casual. It is so closely related to the preparation of the food that usually the two cannot be separated. A seated service of some type is often used and buffet, tray, or plate service as suits the meal involved. In any case the service should add to the friendliness, charm, and enjoyment of the meal.

Courtesy of California Dried Fruit Research Institute

Fig. 169

A picnic party has its charms of which good food is tops.

Party service

The food served at a party is usually called "refreshments." These may be served just before the party ends or soon after the guests have arrived. When the latter is done the refreshments are usually called dessert and likewise are that type of food. Refreshments are generally simple, but there are occasions when elaborate ones are desired.

Daintiness and attractiveness are the keynotes in party menus, and the unusual in food and service is often sought. Sometimes color schemes are carried out, and food combinations are arranged that are delightful in both appearance and flavor. A menu can also be planned in relation to a special date or event, such as Halloween, Washington's Birthday, or Saint Patrick's Day.

The service for party refreshments may be of the plate, tray, buffet, or table type. The method selected depends upon the preference of the hostess as well as the kind of party and refreshments.

Courtesy of California Dried Fruit Research Institute

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Menus for Parties

Light One Course	Medium One Course	Heavy Two Courses
1. Sandwiches or cake Beverage	1. Salad Sandwiches Beverage Nuts or candies	First course: Salad Sandwiches or wafers Relish Beverage Second course: Dessert Nuts or candies
2. Frozen Dessert Cake or wafers	2. Frozen Dessert or equivalent Cake or other accompaniment Beverage Nuts or candies	

Plate service is the simplest and easiest. The guests may sit or stand, according to the nature of the party. Having the guest seated is always more comfortable and should be done whenever possible.

Pass the napkins on a tray, or pass the napkin under the filled plate. Napkins may be omitted at a large party where the guests stand and the refreshments are light.

Pass a filled plate to each guest, serving first the guest of honor if there is one. The plates usually hold the beverage cup, without the saucer, and the silver as well as the food. If preferred, the beverage may be served from a tray after the plates are passed. Pass the sugar and cream, if the beverage requires it, on a tray with the accompanying silver. Take care that the handles are turned at convenient angles that allow each guest to help himself easily.

F. M. Demarest

Fig. 170

Cookies make any day a party.

When two courses are served, bring in the second course on a plate, and exchange it for the first course plate;

Courtesy of National Dairy Council

Fig. 171

The cheese tray with its varieties of cheese and accompaniments is tempting and attractive. This is frequently used for a simple dessert.

Or all first course plates may be removed, and the second course then served. After the guests have finished their food, the plates and napkins are removed.

Tray service is exactly the same as plate service except that the tray provides space for the napkin, a glass of water, and any other desired accompaniments. This makes less passing. The tray, often made of tin, should be covered before the plate is placed upon it; paper doilies may be used to advantage.

Buffet service for a party follows the same general plan as does buffet service for a meal. The details for this service are given on page 703.

Table service is the type used for serving refreshments at bridge or other card parties. It is especially convenient for the guests but requires more effort on the part of the hostess. The food is served at the tables that were used for the games. These are usually of the folding quartet type. When the hostess is ready to serve, the cards, score pads, and pencils are removed, and the hostess and her assistants spread luncheon cloths on the tables. Frequently the food is served when the guests first arrive, with games and other entertainment following. The refreshments, in this case, are usually called "dessert." A small vase with a bud or flower or other decoration is placed in the center of each table. The napkins and silverware that will be required and a glass of water are properly located at each place. The filled plates are then placed on the tables. If the beverage is not served on the plate it should be placed as in a regular meal, depending upon whether it is hot or cold.

If two courses are served, the first course should be removed and the second one brought in and placed. The water glasses should be refilled. The plates may be removed after the guests have departed unless the refreshments have been served early in the evening and the party is to continue.

ACTIVITIES

1. Observe and identify the types of meal service used in each of the following food services:
   (*a*) College residence hall
   (*b*) Café
   (*c*) Hotel dining room
   (*d*) Tea room
2. Discuss with homemakers who do their own work the types of meal service commonly used for family and company meals. Report on the practices and indicate changes that would be made if the services of a maid were available.

3. Plan in detail the service for the meals planned in Activities 1, 2, and 3, Problem 7, this unit.
4. Each person in class groups plan and carry out the service of the meals planned in Problem 7, this Unit, Activity 9. Evaluate in terms of the score sheet on pages 699 and 700.
5. Plan, prepare, and serve a buffet supper.
6. Plan and give a tea.
7. Plan and give a party.

Examples of Various Styles of Meal Service in Detail

In order to outline the details of various types of meal service, a number of styles of service are presented. As will be noted, not every style of service is given for every meal, because each is much the same for the different meals. No matter what style of service is used, adaptations are nearly always necessary, depending upon the menu served and available table appointments, equipment, and helpers.

Informal Breakfast, Family Style

A typical heavy breakfast menu is presented here. If the meal to be served is lighter, it will mean merely the omission of certain of the steps outlined.

MENU

(Planned for a group of six)
Sliced Fresh Peaches
Rolled Oats
Bacon and Eggs
Fried Potatoes
Bread Butter Jelly
Coffee and Milk

Table linens. Place mats are most suitable for this style of service, though a cloth or bare table can be used. Small or medium-sized napkins should be used.

Decoration. Garden flowers or a small potted plant or no decoration other than the food itself may be used.

Laying the cover. For this menu a knife, fork, and three spoons are needed and service silver as indicated in Figure 172.

Place the dishes, silverware, napkins, and food as indicated in the diagram. This permits the entire meal to be put on the table at once, and many steps are thus saved. Place the fruit in an appropriate dish directly on each breakfast plate. Set the dish of cereal at the top of the cover.

Place the dish containing the bacon and eggs, with accompanying serving silver at the right, before the cover where the host will sit. Place the dish containing the potatoes, with the necessary silver at the right, to the left of the host's cover.

Place the beverage service to the right of the hostess or person seated at the foot of the table. If the beverage is not to be poured at the table by some member of the family during the meal, the unfilled cups may be placed at each individual cover and filled just before the meal is announced, or the cups may be filled in the kitchen and placed at each cover. In this meal, the latter plan is used. Milk and water glasses should be filled before the meal is announced. Place the bread, butter, jelly, and the water and milk pitchers before the other members of the family as shown in the diagram.

Place chairs with front edges even with and in line with edge of the table and directly in front of covers. Make any adaptations that may be necessary for the ages and capabilities of the members of the family.

The service of the meal

Pass the sugar and cream as desired during the meal.

After the fruit is eaten, remove the dish and its silver to the left of the cover and place the cereal dish on the plate. When finished with the cereal, return the dish and spoon to the top of the cover.

If the fruit is served during the meal, instead of at the beginning, put it near the plate in a position convenient for eating, and put the cereal dish on the plate before the meal is announced. If the fruit is to be eaten at the end of the meal, transfer the dish to the plate at that time.

Pass the main dish. Follow it with the potatoes. Pass the bread, then the butter, and finally the jelly. Repass all foods as necessary. To refill cups and glasses, pass them to the person responsible for serving these beverages. For points not covered in this discussion, follow the general rules of table service (pages 706 and 707), with the desired adaptations and adjustments.

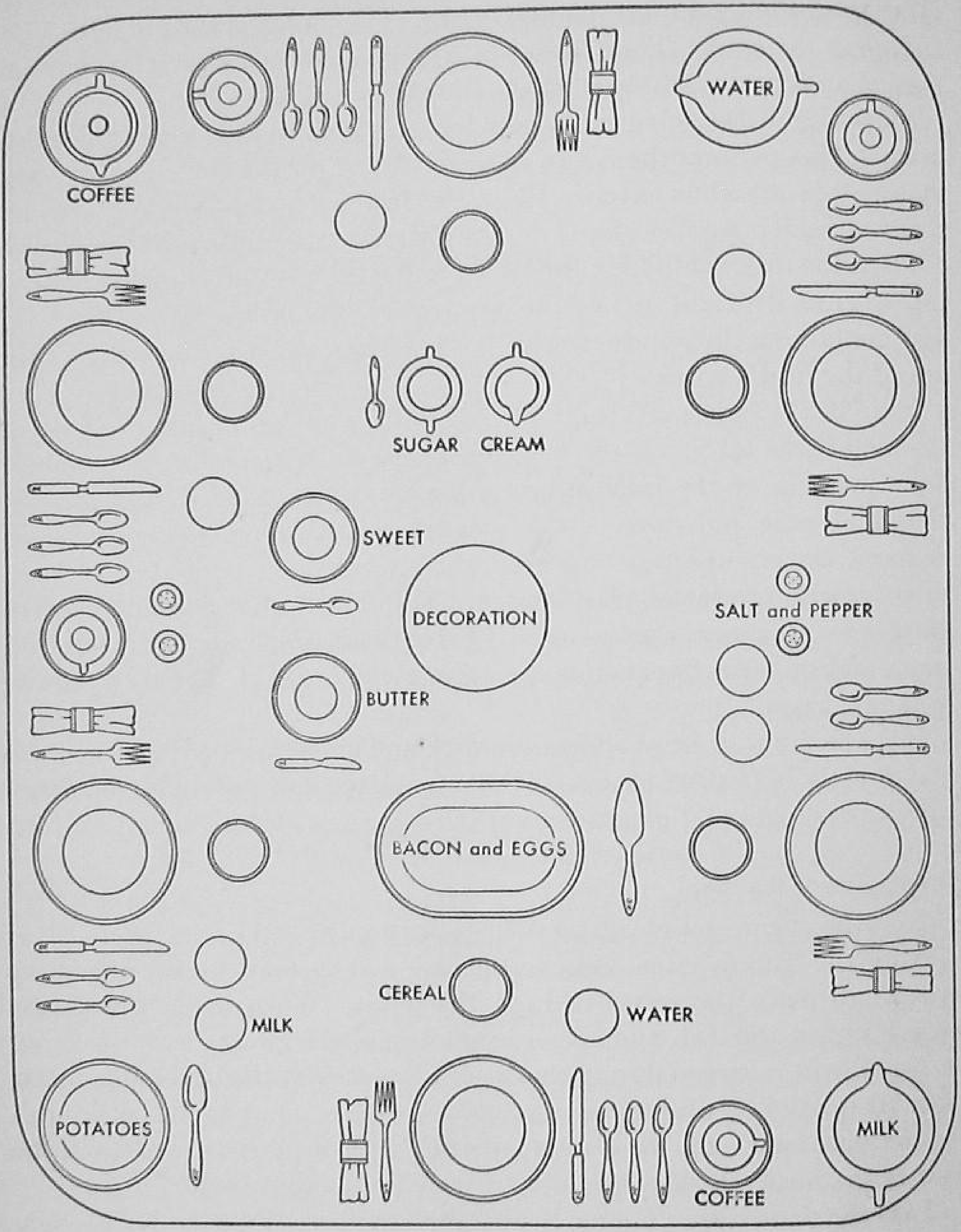


Fig. 172

Family style breakfast table, ready for the first meal of the day. In this meal, all of the food is placed on the table before the members are seated.

Leaving the table

Although it is considered desirable for all members of the group to leave the table at the same time, because of the varying activities of the different members this practice may not be possible. When one person finds it necessary to finish his breakfast and leave before the others are through, he should ask permission of the hostess to be excused.

Informal Breakfast, Compromise Style

MENU

(Planned for a group of four)
Grapefruit
Wheat Flakes Cream
Baked Eggs
Muffins Butter Jelly
Cocoa

Table linens. Place mats, table runners, or a cloth are suitable for this purpose. Napkins of small or medium size should be used.

Decoration. Garden flowers, or a small potted plant, such as a growing fern, may be used.

Laying the cover. For this menu a fork, two spoons, and a butter spreader are needed. Place the forks at the right of the cover, as there is no need for a knife. Place the spoons at the right of the fork and in the order of their use, the one used first at the right.

Place the plate, usually of dessert size, in the center of the cover. Place the bread-and-butter plate at the left of the cover and to the front. Place the butter spreader across the top of the plate parallel to the edge of the table, with the handle to the right. Some prefer to modify this general rule by placing the butter knife diagonally across the plate with the handle toward the center of the cover or across the right or left side of the plate, perpendicular to the edge of the table.

Place the glass for water at the tip of the fork. Put the napkin at the left of the plate with the open edges next to the edge of the table and the plate.

Place the front edge of the chair even with and in line with the edge of the table and directly in front of the cover.

Just before the meal is announced, place the butter, ice cold, on the left side of the bread-and-butter plates. At each cover, place fruit on smaller plates or in dishes, depending upon the kind served. Place cereal in the

Courtesy of John Falkner Arndt and Co., Inc.

Fig. 173

Breakfast, compromise style, with slightly different table setting.

individual serving dishes directly in front of each cover. Pour the water, which should be ice cold.

The general serving dishes. Directly in front of the hostess's cover place the cream and sugar, and to the right of the sugar bowl place the sugar shell.

At the right of the hostess's cover place the cups and saucers for the cocoa and also the plate on which to set the cocoa pot.

In front of the host's cover, place the silver to be used for serving the eggs. If only a spoon is required, put it at the right of the place where the dish of eggs will be set. If both a spoon and fork are used, place spoon at the right and fork at the left of the dish.

Place the jelly, in a suitable dish, in front of the person either on the right or left of the host. Place the jelly spoon to the right of the dish.

Serving table. The serving table is located within easy reach of the

hostess. On it place a pitcher filled with ice water, the service napkin, and any extra silver that may be needed. If the serving table is not used, place these articles on the dining table convenient to the hostess.

The service of the meal

Duties of the hostess. The hostess greets everyone, and if any are guests she indicates distinctly their place at the table. The hostess sits next to the kitchen door as this saves steps.

She removes her napkin from table, half unfolds the napkin if it is a large one, or entirely unfolds it if a small one, and places it on her lap. As she begins to eat her fruit, she guides the conversation, if necessary.

When all are finished with their fruit, the hostess places her own fruit dish on the lower shelf of the serving table. She then asks the persons at the right of the host, then those at the left, and finally the host, for their dishes. The dessert plate remains at each cover. The hostess picks up the cereal dish, sets it on the plate, places the spoon in the sugar bowl, and passes the cream and sugar to the person seated at her right, who in turn passes them on.

When all have finished with the cereal, the hostess places her plate and cereal dish on the lower shelf of the service table and continues as before until all dishes are removed. The host passes his plate to the person at his left, who passes it on to the hostess.

The hostess excuses herself, lays her napkin loosely folded at the left of her cover, and leaves the table. Before going to the kitchen she refills the water glasses if it is necessary, using the service napkin to catch the drip.

From the kitchen she brings to the table warm plates, which should not be too hot, using a napkin as a protection to her hand but not as a holder. From the left side with her left hand, she places the plates directly in front of the host. She then brings in main dish, places it left side, left hand, in front of the host's cover. If the dish is covered, she removes the cover and places it upside down on the serving table. Finally she brings in the hot bread on a plate covered with hot bread cloth, and the pot of cocoa; places the hot bread, left hand, left side in front of the person either at the right or left of host, where space is available; with her right hand places the pot on plate at right of cover, and seats herself.

The hostess serves the beverage while host is serving main dish. Each indicates for whom the serving is intended.

The person at the right of the host is served first.

When all are served, the hostess starts to eat. She asks the person near-

est the muffins to help himself and pass them. Later she asks the person nearest the jelly to help himself and pass it.

When hot muffins are needed, the hostess leaves the table (she need not excuse herself this time), goes to the kitchen, brings in hot muffins, and places the plate in its former position. After she is seated she again asks the person nearest to have a muffin and pass them. She never says "more," and on all occasions avoids implying that a second serving is being offered.

The hostess may offer a second serving of beverage; however, she need not prepare a second serving unless she cares to do so.

The service of the meal without a serving table differs in a few details. When all have finished with their fruit, the hostess excuses herself and removes the fruit dishes and spoons to the kitchen, left hand, left side, two services at a time, beginning with the person to the right of the host and proceeding to the left around the table. When all have finished with cereal, the hostess removes cereal dishes and spoons and dessert plates to the kitchen two services at a time, in the same order as before. Otherwise, the procedure is the same as that given for the service in which a serving table is used.

Duties of the host. The host co-operates in every way possible with the hostess. He serves the main dish that is placed before him.

In serving he does not raise the plate from the table until it is filled and ready to pass to the person for whom it is prepared. If it is too difficult to serve the food in this way, an exception may be made.

The main dish should be placed close to the plates so that there is little danger of spilling the food in serving.

The host offers second servings of the main dish if the amount of food permits; otherwise he tries to divide the main dish into uniform servings.

Informal Luncheon, Compromise Style

Menu

(Planned for a group of four)

Salmon Soufflé
Buttered New Peas
Water Cress Salad
Egg Rolls Butter
Mixed Fruit Cup Wafers
Iced Tea

Leaving the table. Do not appear to rush the meal. Wait until all have finished and have placed their napkins on the table. The hostess places hers there first, and the host follows her lead. The others should be given a reasonable length of time to do likewise. Then hostess and host rise from the table at the same time.

Table linens. Place mats, table runners, or a luncheon cloth are suitable. Luncheon napkins should be used.

Decoration. Garden flowers, or a small potted plant such as a growing fern, may be used. In winter a winter bouquet is often pleasing.

Laying the cover. For this menu a fork, butter spreader, spoon for fruit, and an iced-tea spoon are needed. As there is no need for a knife, it may be omitted. Place the fork, then, at the right of the cover. Place the teaspoon to be used for fruit at the right of the fork and the iced-tea spoon at the right of the spoon.

As there is no first course, no plate or other dish is placed at cover.

Place the bread-and-butter plate slightly to the left and above the place for the plate. Place the butter spreader across the top of the bread-and-butter plate, parallel to the edge of the table, with the handle to the right, diagonally across the plate, or across the right or left side of the plate, perpendicular to the edge of the table. Place the glass for water at the tip of the fork. Serve iced tea in an iced-tea glass and place it on a coaster at the right of the water glass.

Place the napkin as for breakfast, at the left of the cover.

General serving dishes. Place the salt and pepper shakers so that they can be reached easily by all. One set for each two persons is desirable. Place them in line with other objects on the table so as to give symmetry. The salt should be to the right of the pepper.

In front of the host's cover, place the silver to be used for serving the casserole dish. Usually a spoon is all that is necessary, and it is placed at the right of the place where the casserole will be set. Beside the host's individual silver, place the silver for serving the vegetable.

Place the bread, if cold, on the table within easy reach of some member of the group so that he may pass it. A hot bread should be placed with the main part of the meal after guests are seated.

Place the front edges of the chairs even with and in line with the edge of table.

The serving table. Put the serving table beside and within easy reach of the hostess. On it place the pitcher of water and the pitcher of iced tea if a second glass is to be given. Place both pitchers on plates. The sugar for tea may be placed on the serving table rather than in front of the host-

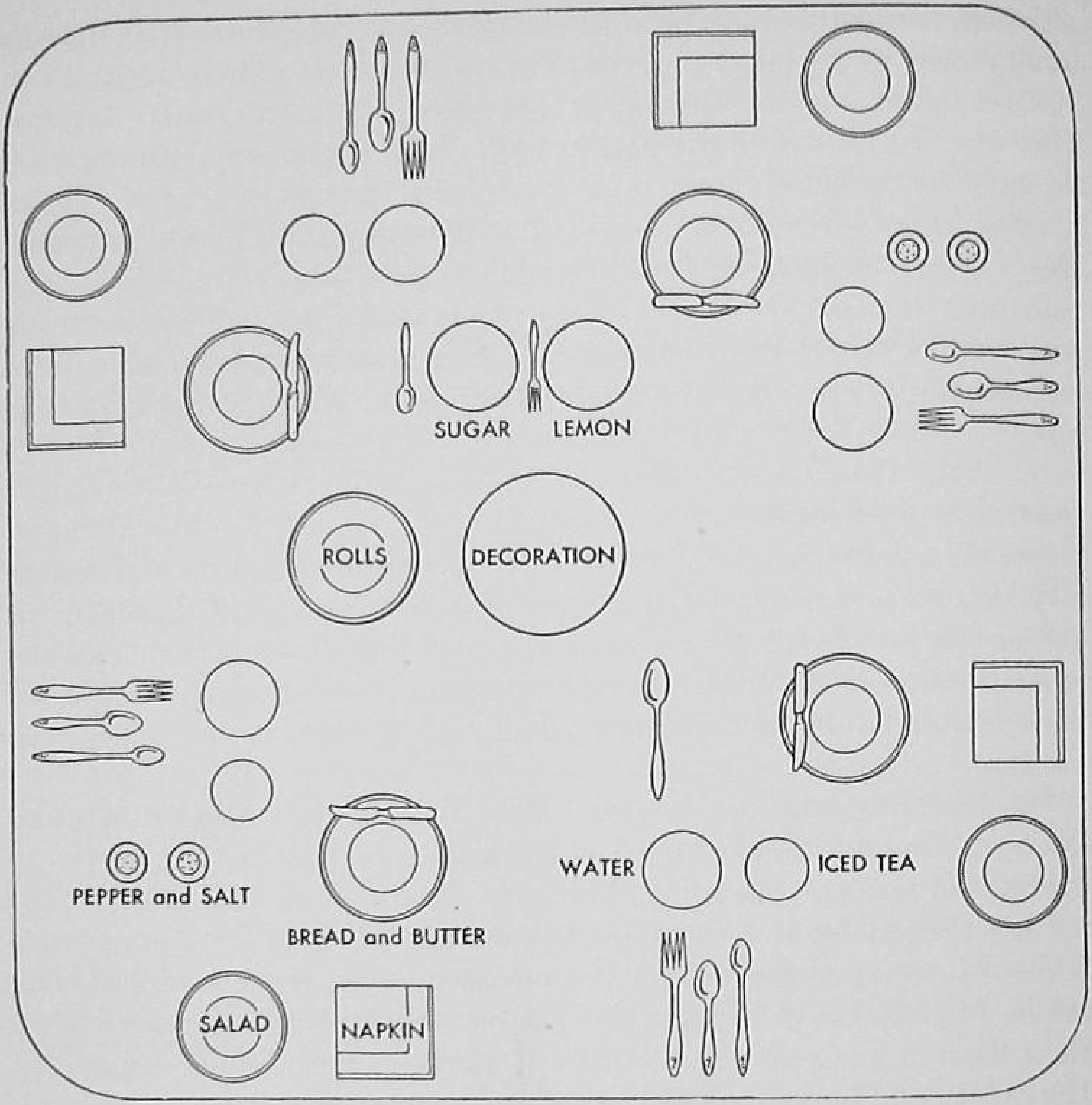


Fig. 174

The informal luncheon compromise style, has a rather definite form to be followed in its setting. Of course, certain of the details depend upon the menu.

ess, if this practice is preferred. Place the serving napkin on the serving table and any extra silver that may be needed. If the serving table is not used place the pitcher of water on the table to the left of the hostess and the pitcher of iced tea to her right.

Just before the meal is served. Place the butter on the bread-and-butter plates at the left and near the edge to allow space for the bread. Then pour the water and the iced tea. Be sure that these are cold. Place the salad on the table, if it is to be served with the main course. As no hot beverage is served, the salad may be placed at the right of the cover,

although there appears to be a general preference for serving it at the left at all times. If the salad is served as a separate course, it may be placed on the serving table before the meal or be brought in when the table is cleared after the first course, as the hostess prefers. Sometimes a salad is served as the first course. In such cases it is placed in the center of the cover, usually before the meal is announced. Some prefer to place the heated plates and all of the food of the first course on the table before announcing the meal. If this plan is followed, the plates should be placed at the host's cover, the casserole at the top, and the dish of peas at the right. The warm rolls should be covered and placed in front of the cover, to the left of the host.

The service of the meal

The duties of the hostess. The hostess announces the meal and directs and leads the guests to the dining room. She indicates distinctly the places at the table. (The hostess's place is near kitchen door.) She asks the guests to be seated. If the food has not been placed before the meal is announced, the hostess excuses herself and, without being seated, goes to the kitchen.

She first brings in warm (not hot) plates on a service napkin, and places them with her left hand in front of the host, serving at his left side.

She then brings in the soufflé in the casserole on a napkin, and with her left hand she places it in front and to the left of the host. If the casserole is covered, she removes the lid and places it upside down on the serving table. She brings in the vegetable dish on a napkin and places it with her right hand at the host's right side. If a second vegetable is served, she brings it in and places it at the left of the host, serving with her left hand. She then brings in warm bread and places it in front of the person at the right of the host. She seats herself and removes her napkin from the table.

After plates are served, she starts eating. She also sees that bread is passed and asks to have it repassed, and she offers a second helping if the host fails to do so.

When all are finished with the course, the hostess leaves her seat and removes the main dish, left hand, left side, and the vegetable dish, right hand, right side. She then takes the bread and other dishes, removing them to the kitchen by twos. After each trip to the kitchen, she brings back two desserts and places them on the serving table, unless they were placed there before the beginning of the meal. The hostess should always plan so as to avoid unnecessary trips to the kitchen.

After the dessert has been brought in, she refills iced-tea and water

glasses, seats herself, and places her own plates on the lower shelf of the serving table — first the luncheon plate, next the salad plate, and finally the bread-and-butter plate, stacking them as necessary. She then asks guests for their plates. After all dishes have been removed, she serves the dessert, first to the guest of honor, second to other guests, then to the host, and finally to herself.

Food is passed to the right, though exceptions may be made when the situation warrants.

If the meal is served without the use of a serving table, the service differs in a few details. The lid of the casserole is usually removed in the kitchen, though the hostess or host may remove it at the table and place it upside down on a small plate provided for this purpose at the right of the casserole.

The hostess, together with the host, is responsible for directing the conversation.

The hostess removes all general serving dishes and silver to the kitchen. Beginning with the person to the right of the host and proceeding to the left around the table, she removes from each cover the dishes and silver of the first course. First she takes off the luncheon plate and silver, left hand, left side, and transfers it to her right hand. Next she removes the salad plate, left hand, left side, and places it on the plate in her right hand. Finally she takes off the bread-and-butter plate and spreader, left hand, left side. Then she carries all to the kitchen.

If the salad is served as a separate course, it is brought from the kitchen, two services at a time, and placed at each cover, left hand, left side, in the same order as was followed in removing the first course. The plates and silver are removed in the same manner when the course is finished.

After filling the iced-tea and water glasses, the hostess brings in the dessert, two services at one time, and places them at each cover, left hand, left side, in the order followed in removing the first course. Many prefer to bring in and place the dessert as the covers are being cleared.

The duties of the host. The host assists in directing the guests to the dining room and seats the guest of honor if this form of courtesy is desired. He then assumes the responsibility of carrying on the conversation while the hostess is placing the food. When she is seated, he follows her lead in removing his napkin from the table. He then serves the plates, putting soufflé on the plate first, then the vegetables. If meat is served, unless it is already in individual servings, he first carves enough to serve all before beginning to serve the plates. He puts soufflé on the plate first, then the vegetable at his right, and finally the second vegetable, if one is

being offered. The host moves neither the serving dishes nor the plates from the table until he is ready to pass the last plate to a guest. Later in the meal he offers second servings of food and assists in every way possible in making the meal agreeable to all.

Leaving the table. The same rules that were given in serving the informal breakfast, compromise style, apply to this meal.

Informal Luncheon, English Style, without Waitress

Menu

(Planned for a group of four)
Clear Tomato Soup   Crackers
Braised Tongue   Buttered Broccoli
Lettuce Salad
Graham Muffins   Butter
Strawberry Shortcake   Whipped Cream
Tea

Table linens. Place mats, table runners, or a tablecloth are suitable. Luncheon napkins should be used.

Decoration. Garden flowers, a small potted plant, a growing fern, or a winter bouquet may be used.

Laying the cover. For this menu a soup spoon, knife, fork, butter spreader, dessert fork, and spoon for tea are needed. Place the fork at the left of the cover, with the dessert fork to its left. Place the knife at the right of the cover, the spoon for the beverage to the right of the knife, and the soup spoon to the right of the beverage spoon.

Place the bread-and-butter plate slightly at the left of the cover and above the place for the dinner plate. Place the butter spreader across the top of the plate, parallel to the edge of the table, with the handle to the right, diagonally across the plate, or across the right or left side of the plate, perpendicular to the edge of the table. Place the glass for water at the tip of knife.

Place the napkin at the left of the cover as in the breakfast, compromise style.

General serving dishes. Place the salt and pepper shakers so that they can be reached easily by all, salt to the right, pepper to the left. One set for each two persons is desirable. Place them in line with other objects on the table so as to give symmetry.

Dana B. Merrill

Fig. 175

An informal luncheon gives opportunity for an attractive setting of the table.

In front of the host's cover, place the meat fork at the left and the tablespoon at the right of the place for the meat. Beside the host's individual silver, place the silver for serving the broccoli. At the right of the hostess's cover place the cups and saucers for the tea and also the plate on which to set the teapot.

In front of the hostess's cover at the right of the place for the soup tureen, place the ladle for serving the soup. At the right of the hostess's individual silver, place the silver for serving the salad. For some salads a large salad fork is sufficient; for others a large salad spoon or tablespoon is needed also. Place the front edges of the chairs even with and in line with the edge of the table.

The serving table. Place the serving table, if used, beside the hostess and within easy reach. On the upper shelf, place the pitcher of water on a plate. The lemon and sugar for the tea can be placed on the serving table or on the table in a position convenient to the hostess. On the lower shelf place the salad plates. If the serving table is not used, place the water pitcher to the left of the hostess and the cups for tea to the right, leaving space for the teapot.

Just before the meal is served. Place the butter on the bread-and-butter plates, near the edge to allow room for the crackers and muffins; then put the dish of butter on the table within convenient reach. Butter need not be placed on the bread-and-butter plates but can be passed when the meal is served.

Pour the water, and place the serving plates for the soup at the hostess's cover and the soup dishes at the right of her silver. Place the soup in a covered tureen in front of the hostess's cover, and the dish of crackers in front of the host's cover.

The service of the meal

The duties of the hostess. The hostess announces the meal and directs and leads the guests to the dining room. She indicates distinctly the places at the table. (The hostess's place is near the kitchen door, and the host sits opposite her.) She sits first so that others may follow her example, then she unfolds her napkin and places it in her lap.

When beginning to serve, the hostess places a soup dish on a serving plate, removes the cover from the tureen and places it on the serving table. She then serves the soup, passing it to the guest of honor first and to the host and herself last. While the soup is being served, the host passes the crackers. Afterwards, the hostess replaces the cover on the tureen.

When the course is finished, she places her own serving plate, soup dish, and soup spoon on the serving table. She then asks the guests for theirs, first those to her left, then those to her right, and finally the host. She stacks these articles on the serving table, and the host passes the cracker dish to the hostess. Passing is done on the side at the left of the host rather than at the right.

The hostess then excuses herself and carries the cracker dish, soup tureen, and ladle to the kitchen. On her return, she brings the warm luncheon plates on a service napkin and places them in front of the host. She places the salad plates at her own cover and carries the used dishes and silver from the previous course to the kitchen. She returns with the meat and vegetable, which she places in front of the host's cover.

The hostess then returns to the kitchen for salad and muffins, and places the former in front of her own cover and the latter at a place convenient for passing. Again she returns to the kitchen, this time for the salad dressing if it is not included in the salad, which she places at the right of the salad and goes to the kitchen for the tea, which she places on the serving table.

She then seats herself, and while the host serves the meat and vegetable, she serves the salad and tea, asking the preference of the guests for lemon and sugar. She asks to have the glasses passed to be refilled with water; asks those nearest the bread and butter to pass them; and then starts eating. If muffins sufficient for only one serving are placed upon the plate, a second plateful, well covered, should be placed on the serving table.

As necessary, the hostess asks her guests to repass the bread and butter, and she inquires whether they will have a second helping if the host fails to do so.

When the course is finished, all general serving dishes and silver except the cream and sugar are passed to the hostess. These she arranges on the serving table and at her cover as convenient. When all pieces have been removed, the hostess places her own plate and silver on the serving table — first the luncheon plate, then the salad plate, and finally the bread-and-butter plate, stacking them as necessary. She asks others for their plates, guests first and host last.

She then asks to be excused, and carries the meat and vegetable dishes and the silver to the kitchen. She returns with the dessert plates, then carries out the salad, and salad dressing dishes, returning with the bowl of whipped cream and a ladle for serving. These she places on the serving table. She then carries the used plates to the kitchen, making more than one trip if necessary. She returns with dessert and silver for serving it. She places the dessert in front of her own cover and the silver at the right of her individual silver.

She then places the dessert plates at her cover, and the cream and ladle at the right of the dessert. She goes to the kitchen to refill the water pitcher and the teapot, and when she returns, seats herself, serves the dessert, and starts eating. During the dessert course she offers a second serving of tea and offers to refill the water glasses. If she desires, the hostess may ask some member of the group to assist her in serving and to be responsible for serving the salad. Throughout the meal, she is responsible with the host for directing conversation.

If the meal is served without a serving table, the details of the service will be slightly different. When the first course is finished the hostess removes the soup tureen, ladle, and cracker dish to the kitchen. Begin-

ning with the person to the right of the host and proceeding to the left around the table, she removes the soup dish, spoon, and serving plate, left hand, left side, from each cover. She transfers these to her right hand and removes the soup dish, spoon, and serving plate from a second cover and carries all to the kitchen.

When a second serving of muffins is needed, the hostess takes the muffin plate to the kitchen and refills it.

When the second course is finished, she removes all the general serving dishes and silver to the kitchen. Then, beginning with the person to the right of the host and proceeding to the left around the table, she removes from each cover the luncheon plate and silver, left hand, left side, and transfers them to her right hand; next the salad plate, left hand, left side, which she places on the luncheon plate; and finally the bread-and-butter plate, left hand, left side. She carries these things to the kitchen before clearing the next cover. When the course service and setting are entirely removed, the hostess brings in the dessert, serving silver, and plates, and places them at her own cover. The other details are the same as for the service in which a serving table is used.

The duties of the host. The host assists in directing guests to the dining room, seats the guest of honor if this form of courtesy is desired, and assumes the responsibility of carrying on conversation during the meal.

When all are seated, he follows the hostess's lead in taking his napkin from the table. He is responsible for passing crackers during the first course, as well as for passing throughout the meal the other foods that are near him. He serves the plates, first the meat with its gravy or sauce, then the asparagus. He moves neither serving dishes nor plates from the table until ready to pass the plate to the guest. An exception may be made, if it is too difficult to serve the food in this manner.

Later he offers second servings of food and in general he assists in every way possible in making the meal agreeable to all.

Leaving the table. The same rules apply to this meal as were given for the informal breakfast, compromise style.

Informal Luncheon, English Style, with Waitress

For this type of meal the same general plan and procedure are followed as in the English service without a waitress, with the following exceptions:

A serving table adjoining the main table is not used. If a serving table is used, it is for the convenience of the waitress and is located near the entrance to the kitchen.

The hostess does not leave the table.

Although the host and hostess serve the food at the table, all food is placed, passed, and removed by the waitress.

Informal Supper, Buffet Style

MENU

(Planned for a group of sixteen or twenty)
Scalloped Chicken
Potato Chips Stuffed Tomato Salad
Sandwiches Pickles Olives
Green Gage Sherbet Individual Cakes
Iced Tea

Two waitresses or assistants will be required for serving this meal.

Table linens. Tablecloths made either of linen, lace, embroidered fabric, or other attractive material, or doilies, or runners are suitable table linens. Luncheon napkins should be used.

Decoration. The decoration should be very attractive. Garden flowers, hot-house flowers, or winter bouquets in season are used.

Arranging the table. A fork, dessert spoon, and iced-tea spoon are needed for each person. Two tablespoons, a salad serving fork and spoon, a pickle fork, an olive fork, a lemon fork, and a sugar spoon are needed for general serving.

Serve chicken at the front end of the table (the end that is nearer the living room). To the right of the plates, which are centered at this end of the table, lay the tablespoon for serving chicken. At the farther end, where the salad will be served, lay the salad serving fork and spoon.

Place the napkins at the left of the plates.

On the left side of the table, place the dish of potato chips with a tablespoon at its right, and the plate or plates of sandwiches covered with a sandwich cloth or napkin. On the farther right side of the table, arrange the forks in an attractive manner. To the left of these, place the pickles and olives and their accompanying silver.

In another arrangement, the table is placed against the wall and only one side and the two ends are used for serving. In this case the decoration is placed at the back of the table, near the wall.

Arranging the buffet. Place the iced-tea service and glasses, spoons, sugar, and lemon, with the accompanying silver, in an attractive manner on the buffet.

The serving table. The water may be served from the serving table.

Chairs. Place a chair at each end of the table for the two persons who are serving the chicken and the salad.

Just before the meal is announced. Place warm plates, not more than six or eight at a time, in their position at front end of table.

Place the chicken in front of the plates. Place the salad at the far end of the table. Fill the iced-tea and water glasses. Also fill a pitcher with iced tea and another with water. Uncover the sandwiches.

The service of the meal

The meal is announced informally by the hostess, who invites the guest of honor or some other person to be served first. Others are asked to follow. Assisted by those serving at the table, the guests obtain food and a beverage and also a napkin and silver. The chicken is served first; for the other foods, the order of service depends on where they are placed on the table.

When served, the guests carry their plates into the living room and are seated.

Assistants or waitresses keep the serving dishes replenished with food during the service. After all are served, pass sandwiches, beverages, and other foods as desired. Remove plates and silver to the kitchen when the course is finished. Bring sherbet and cake and a spoon on a dessert plate from the kitchen and serve each guest individually. Remove this course when finished, picking up the napkin with the plate.

The beverage glass may be retained through the second course. In this case refilling may be necessary.

If small tables are provided for the guests during the meal, these should be located and arranged before the guests come.

Informal Dinner, Family Style

Service for a typical heavy dinner is outlined here. If fewer foods are to be served, it will mean merely leaving out the steps which would be necessary for serving them.

MENU

(Planned for a group of six)
Clear Soup
Roast Leg of Lamb   Mint Sauce
Gravy
Browned Potatoes   Buttered Chard
Tomato and Grapefruit Salad
Bread   Butter
Green Apple Pie
Coffee and Milk

Table linens. A tablecloth may be used for this meal but place mats are preferred and used by many. Dinner napkins should be used.

Decoration. Garden flowers or a small potted plant, such as a growing fern, are used.

Laying the cover. For this menu a knife, a fork, a spoon for the beverage, a spoon for soup, and a fork for dessert, as indicated in Figure 178, are needed. Follow the general rules for setting the table, and place the appointments and food according to the diagram. In this style of service all of the food is placed on the table at one time. Place chairs with the front edges even and in line with the edge of table.

Placing the food. Place the soup, which is to be eaten first, on the dinner plate. Place the meat, and the silver for serving it, at the right of the dish before the cover at the head of the table. Place the potatoes at the right of the same cover and the chard at the left. Place the necessary silver at the right of each dish. Place other foods according to the diagram (Figure 178), making any changes necessary to adapt the plan to the particular needs of the family.

Place the salad according to the manner in which it is to be served. It may be served in a salad bowl from which each person helps himself as it is passed, or it may be served on individual plates by someone at the table and passed. The dessert also may be served in either fashion.

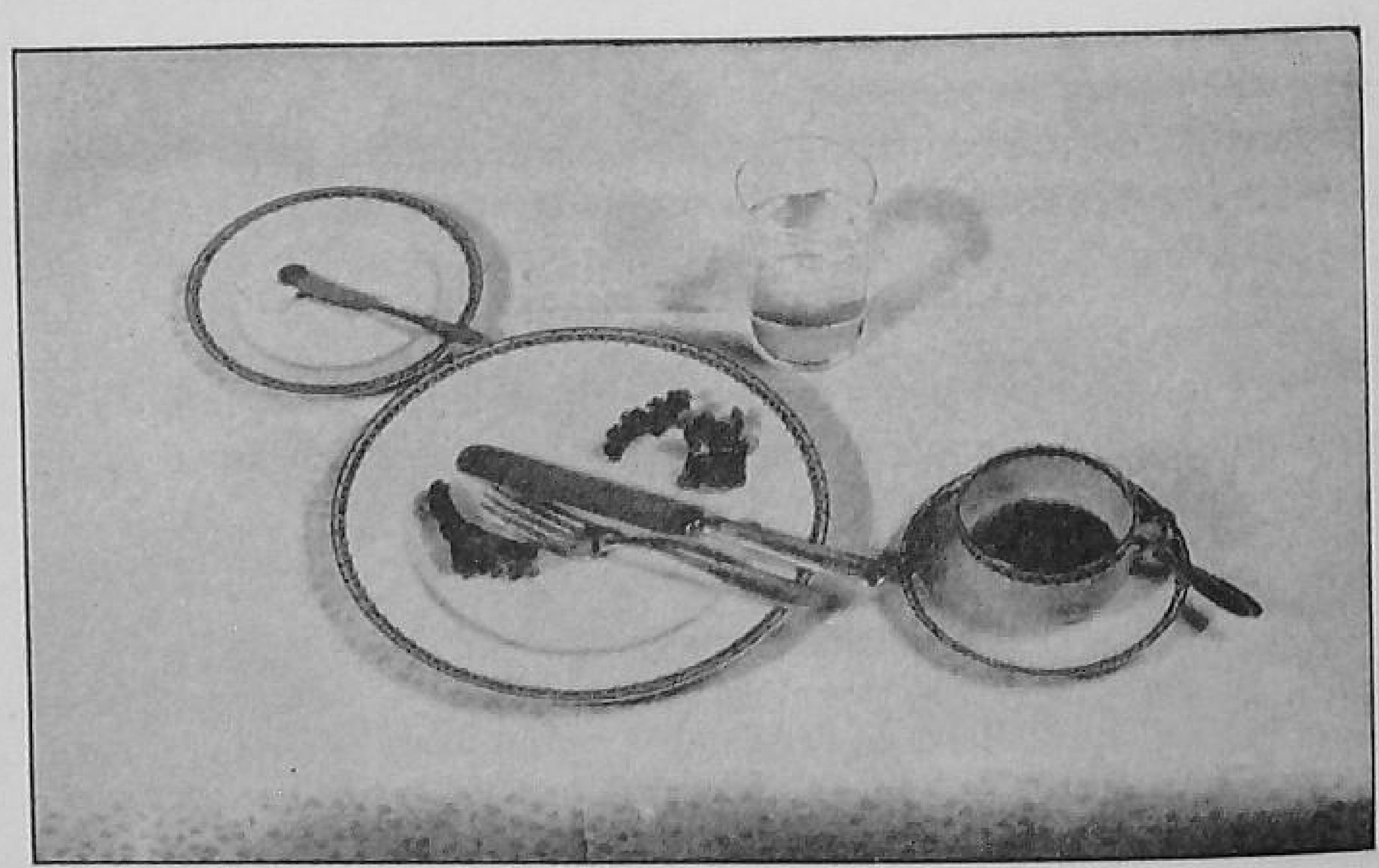


Fig. 176

The silverware — knife, fork, butterknife, and teaspoon — is placed on the plate in the proper position at the end of the main course.

Fill the milk and water glasses before the meal is announced, and then refill the pitchers and place them on the table.

Serving the food. After the soup is eaten, the soup dishes and spoons may be removed by some member of the family and carried to the kitchen or some other convenient place. Otherwise, place these to the left of the plate in the space originally occupied by the napkin.

Meat should be passed to the right and followed by the potatoes, then the chard, bread, gravy, and butter. The hostess serves the coffee, with cream and sugar as each person desires. Repass all foods as desired, always in the same direction. Refill cups and glasses by passing them to the person who serves the beverages.

The salad should be eaten with the main part of the meal, using the dinner fork.

After the main course is eaten, the dinner plate should be exchanged for the dessert service.

Leaving the table. All members of the group should leave the table together. The hostess indicates the time of leaving. If for any reason it becomes necessary for one person to leave earlier, he should ask the host or hostess for permission to be excused.

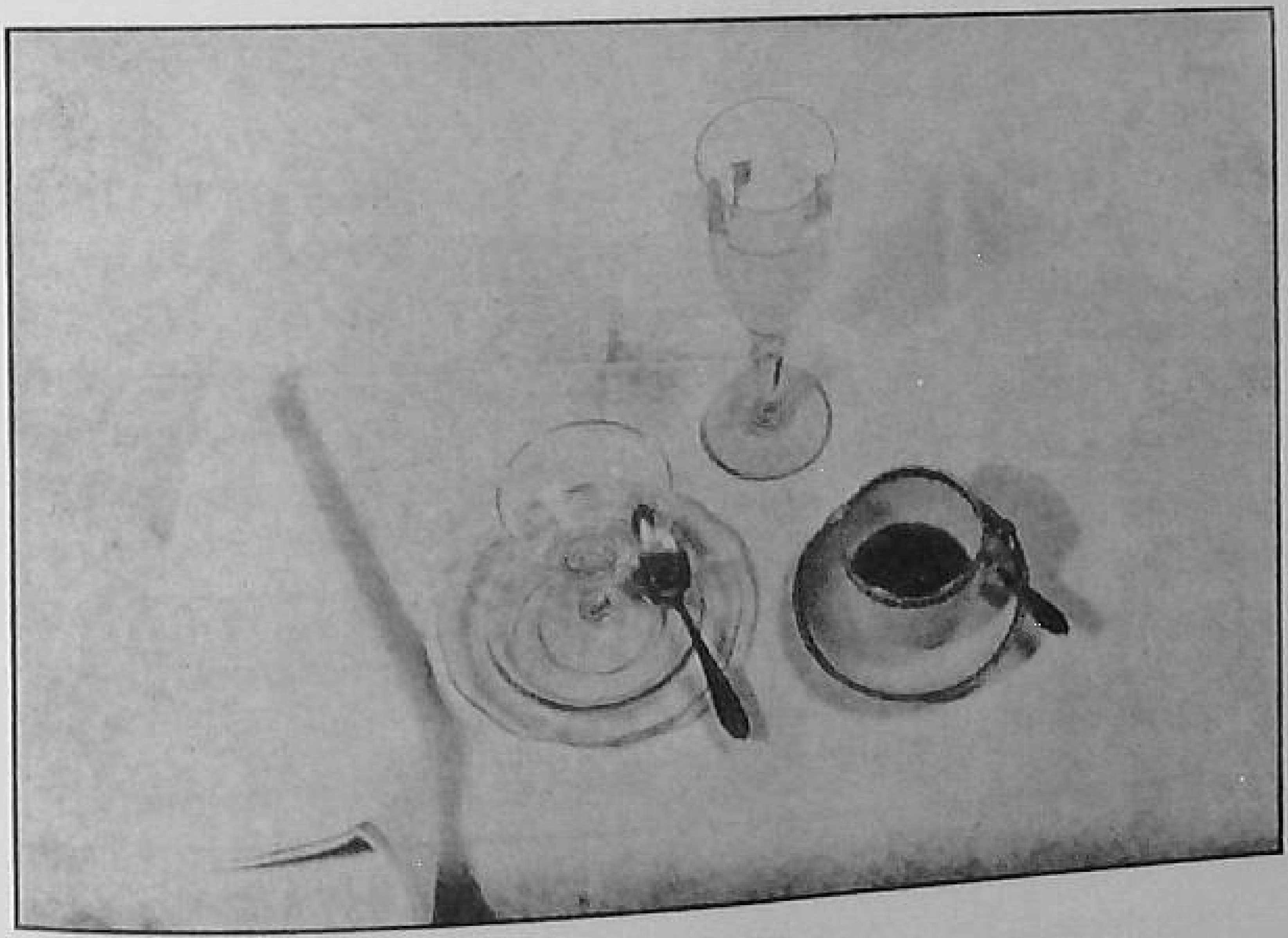


Fig. 177

Table appointments — silverware, napkin, and other articles — should be placed properly at the end of the meal. The cover should present a more or less orderly appearance when the diner leaves the table.

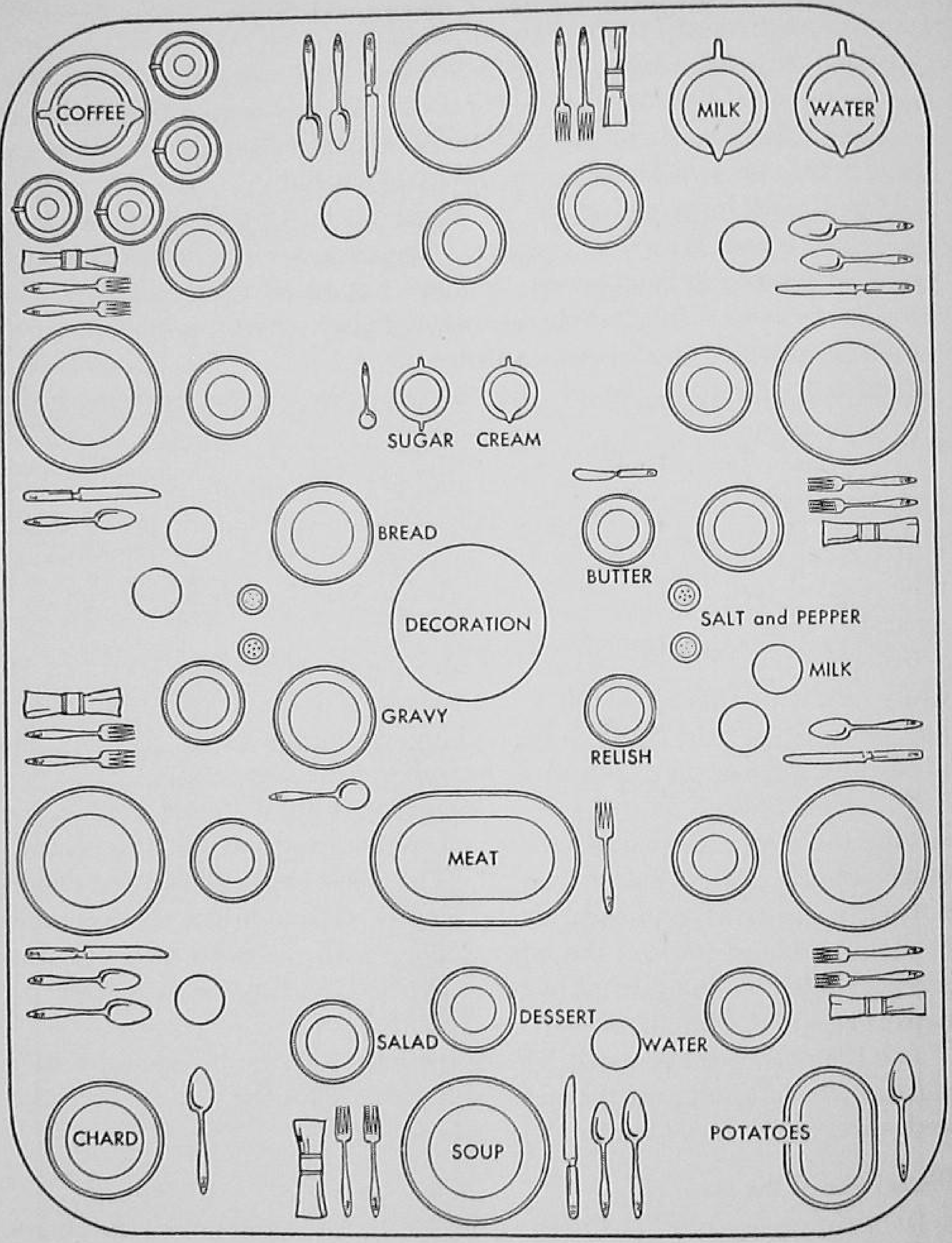


Fig. 178

Family style dinner is set much like family style breakfast. Many households find it desirable in many ways.

Informal Dinner, Compromise Style

Menu

(Planned for a group of four)

Baked Pork Chop
Browned Potatoes   Buttered Asparagus
Tomato and Cucumber Salad
Whole Wheat Rolls   Butter
Strawberry Short Cake
Coffee

Table linens. A tablecloth may be used for this meal but the trend today is to use place mats even for dinners. Dinner napkins should be used.

Decoration. Garden flowers or a small potted plant are suitable.

Laying the cover. For this menu a dinner knife, dinner fork, dessert fork, butter spreader, and spoon for the beverage are needed. At the present time a salad fork is not usually included unless the salad is served as a separate course.

General serving dishes. Place salt and pepper shakers so they can be easily reached. One set for each two persons is desirable. In front of the host's cover place the silver to be used for serving the meat. To the right of the host's cover place the silver for serving the vegetables.

The serving table. If coffee is to be served with the main course, the serving table may be placed beside and within easy reach of the hostess, otherwise it is placed against the wall. The coffee cups and saucers, cream pitcher, sugar bowl, and sugar spoon may be placed on the serving table or dining table in front of the hostess along with the coffee pot. On the serving table also the pitcher of water is placed on a plate with a service napkin beside the pitcher.

Just before the meal is served. Place the butter on the bread-and-butter plates at the left and near the edge to allow space for the bread. Pour the iced water. Place the salads at left of each cover.

The service of the meal

Duties of the hostess. The hostess checks the table and places the chairs in line and even with the edge of the table. She announces the meal and directs her guests to dining room, indicating distinctly their places at the table. (The hostess's place is near the kitchen door.) She asks guests to be seated, excuses herself and goes directly to kitchen. She brings in the warm dinner plates on a service napkin and places them, left hand, left

side, in front of host, left hand, left side. Then she brings in the platter of pork chops, using a service napkin, and with her left hand places the platter in front of the host in the center of the cover. Next she brings in the dish of potatoes on a napkin and places it right hand at right side of host's cover. After this she brings the dish of asparagus on a napkin and places it at left of the host, left hand. If preferred the two vegetables may be brought in at the same time without the use of the napkin. In order to save space it may be desirable to arrange the meat and one of the vegetables on the same platter. In this case the other vegetable would be placed at right of host's cover. She brings in the hot rolls in left hand and coffee in right hand. She places the coffee at right of hostess's cover and then places the rolls with the left hand, left side in front of the guest at the right of the hostess. The hostess seats herself, removes her napkin from the table, and pours the coffee while the host serves the plates. The hostess asks each guest his preference as to cream and sugar, which is placed in the cup before the coffee is poured. After the places are served and the coffee is poured hostess starts eating. She then takes the coffee pot to the kitchen. As the meal proceeds, she sees that the rolls are passed, asks to have the rolls repassed, and offers second servings if the host fails to do so.

When all have finished with the main course, the hostess leaves her seat and removes the meat platter, left hand, left side, and the potato dish, right hand, right side, and carries them to the kitchen. She removes the asparagus dish, left hand, left side, and transfers it to right hand; she then removes the roll plate, left hand, left side, and carries them to the kitchen. Then she refills the water glasses, and brings in the pot of hot coffee.

Beginning with the person at the right of host, the hostess removes to the kitchen the dishes and silver of the first course from each cover. In doing so she follows this procedure: removes the dinner plate and silver, left hand, left side, and places the salad plate on plate in right hand; removes the bread-and-butter plate and spreader, left hand, left side, and places these on the salad plate. This service is then carried to the service table. In doing this the hostess is careful to do the stacking of dishes back of the person. Next she clears host's cover in the same order. She then picks up the first service from the service table with her left hand and carries both to the kitchen. On returning from kitchen, the hostess brings two desserts and places them on serving table. The covers of the other persons and the hostess are next cleared in the same manner as previously described. The last two desserts she brings from the kitchen and places them, left hand, left side, in front of person at the right of host and the

host. The remaining desserts on the serving table are then placed, left hand, left side, in front of the other guests and the hostess. Many prefer to bring in and place the desserts as the covers are being cleared which is also an approved procedure.

When the desserts are served, the hostess seats herself and starts eating her dessert, pausing to offer second servings of coffee.

Duties of the host. The host assists in directing guests to the dining room and seats guest of honor if this form of courtesy is desired. He assumes responsibility for carrying on the conversation while the hostess places the food. When hostess is seated, he follows her lead in removing his napkin from the table and then serves the plates. If the meat is not in individual servings, a sufficient quantity for all is carved by the host before serving any plate. He first puts the meat on plate, then the potato to its right, and lastly the asparagus. He moves neither serving dishes nor plates from the table until ready to pass the first plate (which is served to the person at his right). The host offers second servings of food to the others at the table.

Leaving the table. The same rules that were given in serving the informal breakfast and luncheon compromise style, apply to this meal.

Informal Dinner, Compromise Style, with Waitress

This type of service is frequently used for an informal meal when the hostess wishes to remain seated at the table and to have assistance in serving the food. The serving table is used for the convenience of the waitress and is located near the door leading to the kitchen.

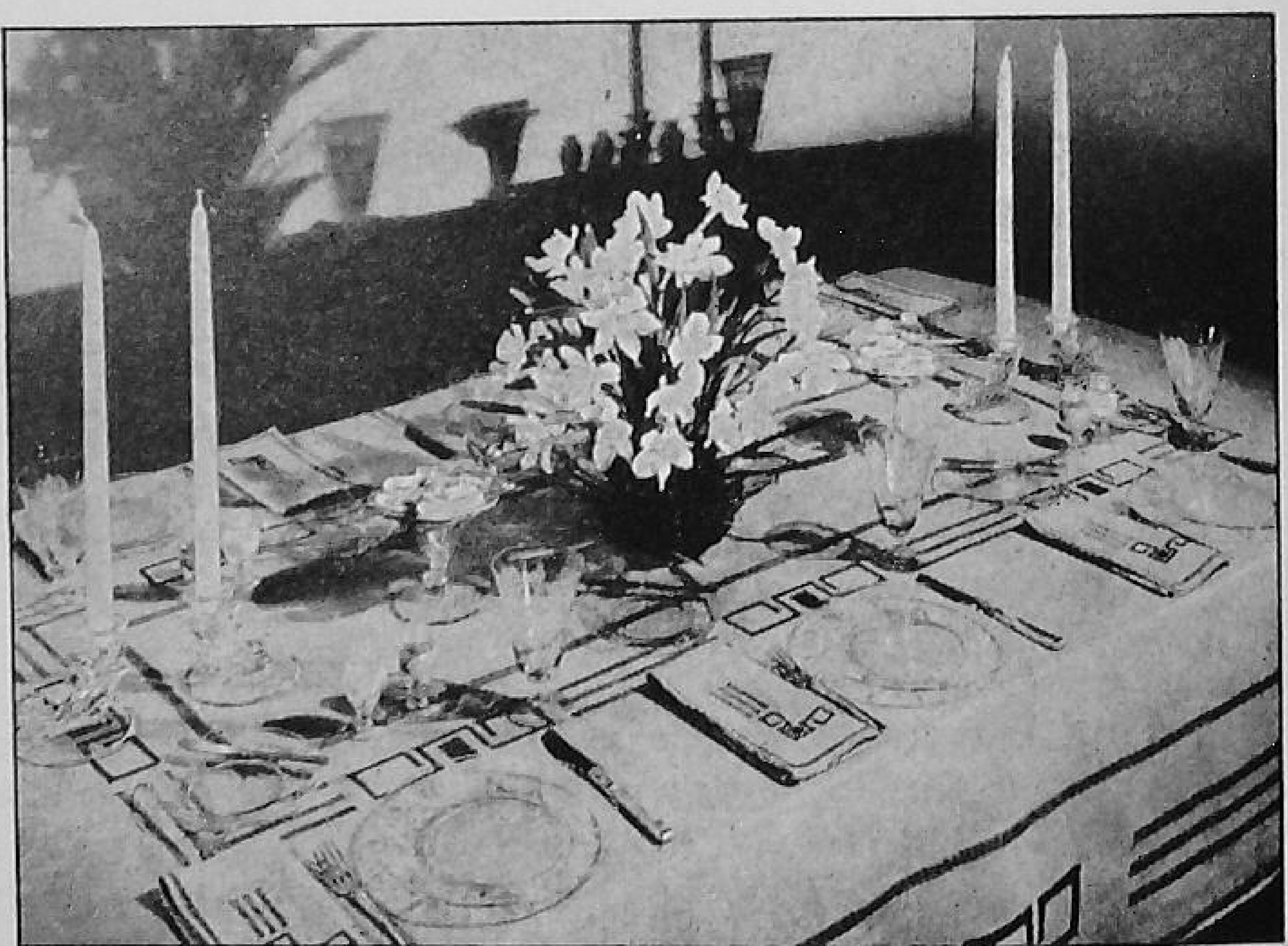
If the preliminary course is a cold one, the waitress places it on the table before the guests enter the dining room; if a hot course, she serves it after the guests are seated, left hand, left side, beginning with the guest of honor and ending with the host and hostess. The salad may be placed on the table either before the meal is announced or with the serving of the second course.

The waitress removes the preliminary course, left hand, left side; then, using a service napkin, she places, first, warmed plates, and then the main dish, in front of the host, left hand, left side. If the main dish is covered, she uses a service napkin to lift the cover, invert it, and carry it to the serving table; when the host has finished serving, she replaces the cover. Using a service napkin, she brings in the main vegetable and places it, with her right hand, at the right side of the host's cover. She then brings in the second vegetable and gravy and places these on the serving table left hand, left side, after the plates are served.

The waitress stands at the left of the host with a napkin in her left hand; as the host serves each plate, she takes it from the pile in front of him, left hand, left side, and places it before a guest. (The order in which the guests are to be served will have been given her previously by the hostess.) Using a napkin, she passes the second vegetable, then the gravy, and then the bread, left hand, left side.

She next brings in the coffee and places it to the right of the hostess, who pours. Standing at the left of the hostess, she receives each cup as it is filled, and places it at a cover, right hand, right side, with the handle to the right, serving in the order in which she served the plates. No napkin is needed in serving the coffee.

She repasses the bread and the second vegetable, as needed, in the same manner as before; and refills the glasses as necessary, right hand, right side, if possible without moving them. If a guest accepts a second helping of the main dishes, the waitress takes the plate from the cover, left hand, left side, carries it to the host (using a service napkin), and returns the filled plate to the guest.



Courtesy of Fostoria Glass Co.

Fig. 179

Company dinner is the meal for which this table is set. The napkins are placed with the loose corner at the lower left, a method sometimes used.

When the course is finished, she removes the meat platter, with its serving silver, then the vegetable dishes and their serving silver. Beginning with the person served first and progressing in the same order as for the service, she removes the dinner plate, left hand, left side, transfers it to her right hand, then removes the salad plate, left hand, left side, and carries them to the kitchen. She next removes the bread-and-butter plate, left hand, left side, and carries it to the serving table, from which she carries them to the kitchen by twos. She uses no napkin in removing the plates, and she should clear each cover completely before beginning to clear another.

The salts and peppers, and any silver not needed for the last course, she removes on a tray. She removes the coffeepot in order to reheat the coffee; after dessert is served she will replace it. As needed, she brushes crumbs from each cover, left hand, left side, with a folded napkin to a plate or crumb tray. The glasses are refilled if necessary.

The waitress then serves the dessert, left hand, left side. Any accompaniments are placed, with the dessert, on the front or left side of the service plate. Silver for the dessert course may have been placed at each cover when the table was set, or it may be placed from a tray, right hand, right side, before dessert is served, or it may be brought in on the dessert plate. At this time, the waitress brings back the coffeepot which has been reheating, and replaces it beside the hostess's cover, right hand, right side. She then brings each person's coffee cup to the hostess to be refilled, and replaces it, right hand, right side.

For the manner of leaving the table, the same rules apply as were given for the informal breakfast served in compromise style.

Formal Dinner, Russian Style

MENU

Shrimp Cocktail
Roast Chicken Gravy
Mashed Potatoes Buttered Brussels Sprouts
Lemon Ice
Cloverleaf Rolls
Cucumber and Pineapple Salad
Cheese Wafers
Individual Pumpkin Pies
Coffee
Nuts Candy

Table linens. For a formal dinner the hostess uses her best and most at-

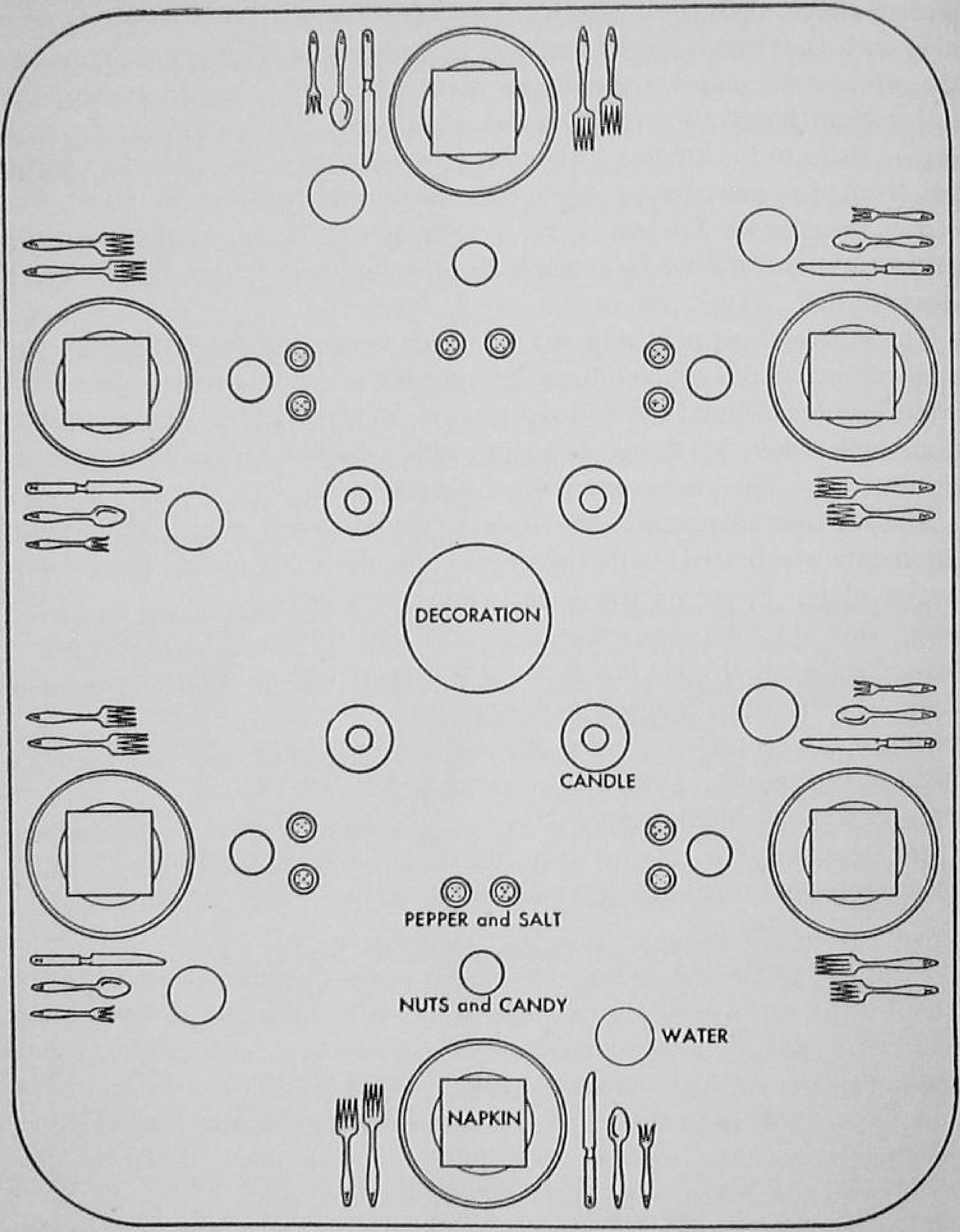


Fig. 180

A formal dinner requires a formal setting of the table, as this diagram shows.

tractive linens. Only a tablecloth, preferably white, is suitable for this meal. Dinner napkins are essential.

Decoration. The table may be suitably decorated with flowers, fruit, winter greens, or other centerpiece, and candles may be used. The arrangement of decoration should be formal but attractive. Place cards and favors, if used, are placed on the napkin. Nut and candy cups are placed at the top of each individual cover.

Laying the cover. The general directions for setting the table, as already given, are followed, except that nothing is placed on the table but the decorations and the articles that belong to the individual cover. For this menu, a cocktail fork, a dinner knife, dinner fork, salad fork, dessert fork, and after-dinner coffee spoon are required.

Place a service plate at each cover. To the right of the service plate, place the knife and the cocktail fork; to the left of the service plate, the dinner fork; and to the left of the dinner fork, the salad fork. Dessert forks and coffee spoons are to be brought in with the course to which they belong. The goblet for water should be at the tip of the knife. The napkin is placed at the left of the forks, when the first course is placed before the guests are seated; otherwise it is placed on the service plate.

Place individual salt and pepper dishes, salts to the right and peppers to the left, directly in front of each cover.

Place the front edge of each chair even with and in line with the edge of the table, directly in front of the cover.

Serving table. The purpose of the serving table, if used, is to facilitate service by the waitress, and it should therefore be located near the door to the kitchen. If a serving table is not used, all food will be brought directly from and removed directly to the kitchen.

The duties of the hostess. The hostess receives the announcement of the meal by the waitress or waiter, and so indicates by a nod or bow to the host. She and her escort are the last of the group to enter the dining room. She signals the guests to be seated, assists with conversation, indicates the time for serving and removing each course, and gives any needed directions to the waitress in a quiet and unobtrusive manner. When the dinner is over, she indicates the time for leaving the table.

The duties of the host. The host, escorting one of the guests (usually the guest of honor) leads the group to the dining room. He receives the indication from the hostess for seating, and seats the guest of honor. The other men in the party do the same for the women they escort into the dining room. The host assumes the responsibility for directing the conversation.

The duties of the waitress. Just before announcing the meal, the waitress fills the goblets with water, and places on each service plate the chilled cocktail served in a cocktail glass on a small plate.

The service of the meal. A waitress or waiter is required for all of the service. A service plate is used for each cover and is left on the table until exchanged for the first hot plate. A guest is never left without a plate at his cover, except before the dessert course when the table is cleared and crumbed.

Plates are brought in and removed one at a time. All dishes of food are held on the left hand on a folded napkin when offered to the guests. When plates are being exchanged or dishes of food removed from the table, the service napkin is not used.

The waitress serves first the hostess, next the guest of honor, then the other guests in an order previously indicated by the hostess, and last the host. She refills the goblets with water as needed; they should be kept well filled throughout the meal.

When the first course is finished, the waitress removes the cocktail fork, cocktail glass, small plate, and service plate together, right hand, left side, and places at the cover, left hand, left side, a warm plate with a serving of roast chicken, gravy, mashed potatoes, and Brussels sprouts. If a bread-and-butter plate is used, she places it (with a roll upon it), left hand, left side, slightly to the left of the top of the fork. If bread-and-butter plates are not used, she passes a plate of rolls, left hand, left side, from which each person serves himself. If a second serving of rolls is offered, she removes the bread-and-butter plate, left hand, left side, and places the replenished plate in the same manner, or repasses the plate of rolls as in the first serving.

The ice is placed at the top of the cover and slightly to the right, or beside the cover and to the right, right hand, right side.

When the course is finished, the waitress removes from each cover the dinner plate and silver used for this course, right hand, left side, and places the salad, arranged on a salad plate, left hand, left side. She removes the ice, right hand, right side, and the bread-and-butter plate, if used, left hand, left side. When the salad course is finished, she removes the salad plate, left hand, left side, and also removes onto a tray any used silver, right or left hand.

The waitress then takes the salts and peppers from the table, one at a time, left hand, left side, and transfers them to a tray held in her right hand. She crumbs the table with a folded napkin and a small plate, left hand, left side, in the same order in which the guests were served.

She next places the fork for dessert, right hand, right side, or places it on the upper side of the dessert plate with the dessert.

After-dinner coffee may be served at the table or in the living room. If coffee is served at the table when the dessert course is finished, the waitress removes the dessert plate, right hand, left side, and places an after-dinner coffee cup, left hand, left side, in front of each guest. The handle should be to the right, and an after-dinner coffee spoon, if used, lies on the saucer parallel with the handle of the cup. If sugar is offered, two lumps may be placed on the saucer, or it may be served with tongs on a tray presented by the waitress, left hand, left side. If coffee is served in the living room, it is usually poured by the hostess seated at a small table, and the cups are passed by the waitress. If candies are not a part of the decoration, the waitress passes them at this time, left hand, left side, using a tray.

When coffee served at the table is finished, the waitress removes the cup, right hand, left side, and places a finger bowl set on a doily on a small plate, left hand, left side. Finger bowls are left on the table at the end of the meal.

Leaving the table. The hostess indicates to the host the moment for leaving the table. The host then arises and assists the guest of honor, accompanying her to the living or reception room. Others do the same, with the hostess and her escort leaving the dining room last.

In Russian service, it is sometimes the practice for the waitress to place the plates for the main course at each cover and to offer the food in appropriate serving dishes, left hand, left side, so that each person may serve himself. The chicken, gravy, potatoes, and Brussels sprouts may be served in this manner, and also the bread.

Introductions, Invitations and Acceptances

The maintenance of already established social contacts is important. The old saying, "Politeness is to do and say the kindest thing in the kindest way," implies the importance of both word and deed in social relationships. In most cases one is responsible for maintaining an established contact either as host or hostess or as guest. In the first instance, a person is proffering hospitality and has the responsibility of determining the character of the hospitality extended and of securing the ease and satis-

faction of his guests. In the second, a person as guest must receive the hospitality in a manner that assures the host of his pleasure and that adds to the shared enjoyment of the group. As the success of any occasion is a joint responsibility of host and guest, the direction of the efforts of both may be made easier by due consideration of the responsibilities that matter-of-course usage has allotted to each.

This is true in even so simple a matter as extending greetings and making introductions. Certain forms are accepted both by those who have given the matter "reasoned thought" and by those who unquestioningly follow common social usages.

Introductions

According to ancient custom, the right to speak first in extending greeting was regarded as a royal prerogative; in the absence of royalty it was accorded women; and within groups of one sex, it was usually given to the eldest. Custom, having established the rule, has gone further and given a formula by which the courtesy may be acceptably extended. On formal occasions the word "present" is more favored than the word "introduce," though both terms are used. The correct formal introduction is:

Mrs. Brooks, may I present Mr. Best?
or
Mrs. Brooks, may I introduce Mr. Best?

On informal occasions neither word need be expressed, though it is understood, as "Mrs. Brooks, Mr. Best," or "Mrs. Brooks, this is Mr. Best." It is often enough to say, "Mr. Best, do you know Mrs. Brooks?" or "Mrs. Jennings, do you know Mrs. Brooks?" Another form frequently used is: "Mrs. Jennings, have you met Mrs. Brooks?" or "Mr. Best, have you met Mrs. Brooks?"

The generally accepted way of acknowledging an introduction is to say in a friendly and pleasant manner, "How do you do?" If desired, the name of the person introduced may be added, but this is not necessary.

When introduced to her hostess or to a woman much older than herself, a woman always rises to acknowledge the introduction. However, a woman does not rise to receive an introduction from a man, unless she is the hostess. The hostess not only rises but also extends her hand to the guest. A man always rises when introduced to a woman or another man.

Custom and personal preference determine to a large extent whether there will be handshaking when introductions are made. With some groups it is customary. Men generally shake hands when introduced. With women, the older woman has the prerogative in the matter of shaking hands; with a woman and man, the decision rests with the woman. However, one should never refuse an offered hand no matter who takes the initiative in extending it.

Often there are occasions when it is necessary to introduce oneself. One may say: "I am Helen Wilson," "I am Miss Wilson," or "I am Mrs. Harry Wilson." The hand may or may not be extended, as desired.

In leaving a person or group with whom introductions have been made, one may slip away inconspicuously after a brief period of conversation, or may end the conversation graciously with a remark such as: "I have enjoyed meeting you," "I hope we shall meet again in the near future," or "It has been a pleasure to know you."

The wholesale introduction of a stranger to a large group has little of helpfulness or true kindliness in it. The person should make the acquaintance of two or three in a small group and should gradually meet the others as they come up. A conversation between two persons should not be interrupted to introduce a third, unless very long.

Invitations

Extending and accepting invitations are steps in establishing social contacts that usage has reduced to routine. If rules were to be formulated to express this routine, they might run as follows:

1. The invitation should be in keeping with the nature of the event, i.e., a formal invitation for a formal dinner or dance; an informal note or oral invitation for the Sunday "home dinner."
2. The response should be in keeping with the invitation, and should usually repeat date and time to prevent misunderstanding.
3. The response should be prompt.
4. When an invitation has been accepted, punctual appearance is obligatory.

A formal invitation, with due regard for spacing, is worded thus:

Mr. and Mrs. Joel Rankin
request the pleasure of
Miss Sarah Louise Brown's
company at dinner
on Monday the eighth of August
at seven o'clock

A formal invitation calls for a formal response:

Miss Sarah Louise Brown
accepts with pleasure
Mr. and Mrs. Joel Rankin's
kind invitation for dinner
on Monday the eighth of August
at seven o'clock

If it is necessary to send regrets to a formal dinner, the phrasing should be formal:

Miss Sarah Louise Brown
regrets that she is unable to accept
Mr. and Mrs. Rankin's
kind invitation for dinner
on Monday the eighth of August

An informal invitation is written in the first person. Response should be in similar form. A typical informal invitation follows:

Dear Mrs. Brown:
Will you and Mary have lunch with me on Wednesday, the fifth of August, at one o'clock?
I am eager to chat with both of you and hope you can come.
Most sincerely,
Sarah Black

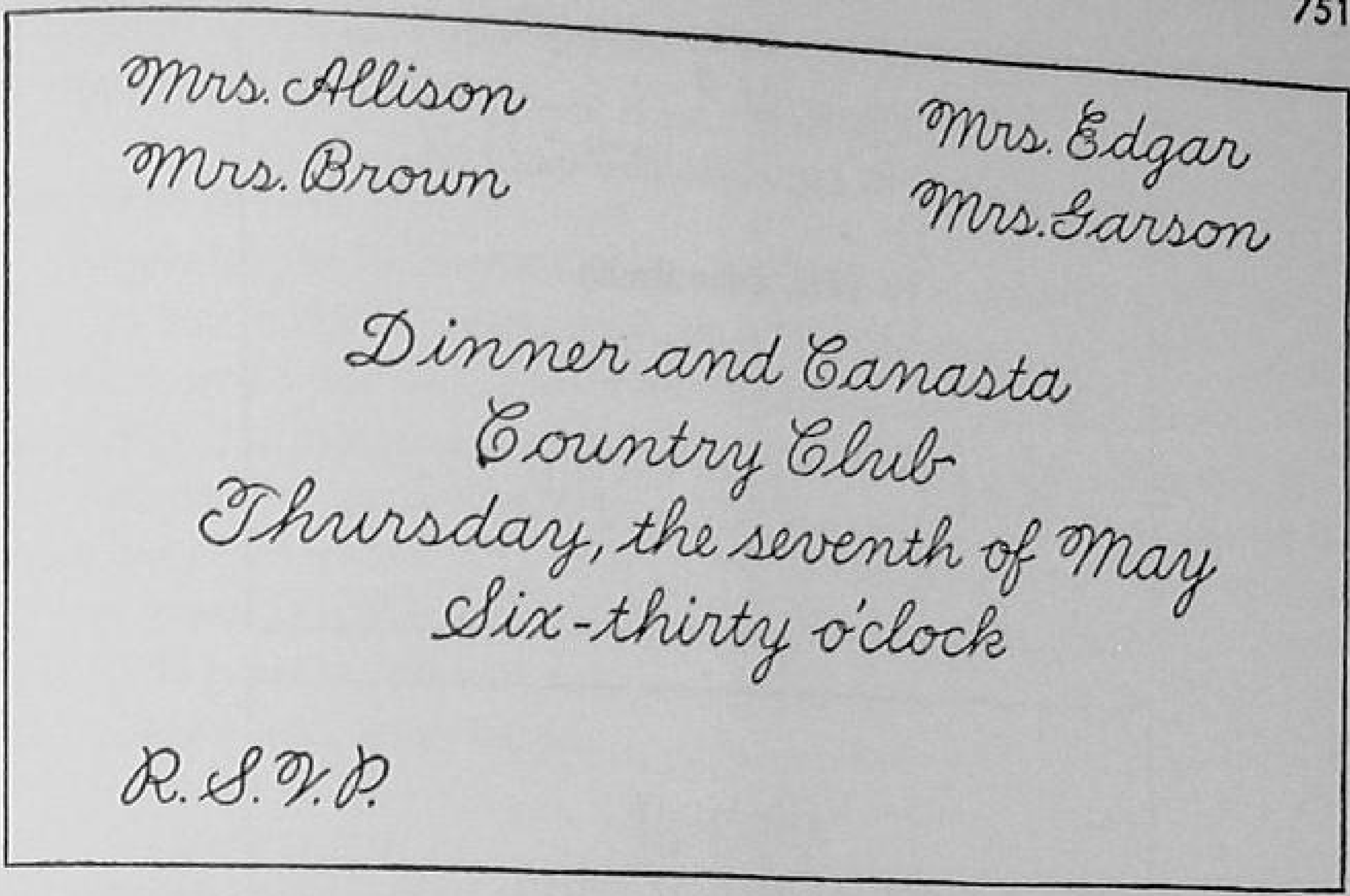
An informal acceptance:

Dear Miss Black:
Mary and I will be happy to lunch with you on August fifth, at one o'clock. We both appreciate your thoughtfulness.
Cordially yours,
Anna Brown

An informal regret:

Dear Miss Black:
Mary and I are so sorry that it will be impossible for us to lunch with you August fifth. Mary has agreed to play in the tennis tournament at Brownell that day, and I am pledged to cheer for her victory. We are both regretful that we are unable to come.
Cordially yours,
Anna Brown

A form of invitation often used if there are two or more hostesses is shown in Figure 181.


Mrs. Allison
Mrs. Brown

Mrs. Edgar
Mrs. Garson

Dinner and Canasta
Country Club
Thursday, the seventh of May
Six-thirty o'clock

R.S.V.P.

Fig. 181

Where there is more than one hostess, a handwritten invitation of this sort is acceptable.

If the party is to be held in a club or other public place, the acceptance is customarily addressed to all the hostesses in the order in which their names appear on the invitation; the reply is mailed to the person whose name appears first on the list. It is permissible for a guest to send her acceptance to the hostess whom she knows best. If the party is to be given in the home of one of the hostesses, the acceptance or regret is addressed to her at her home address.

Visiting card invitations may be issued for an informal dance, musical, picnic, tea, or similar party. An abbreviated form may be used. For an example, see Figure 182.

A visiting card invitation, like an engraved invitation, requires an answer that is formally worded in the third person. Personal stationery is used. Occasionally, but perhaps less correctly, the visiting card may convey acceptances or regrets. An example is shown in Figure 183.

When the invitation does not call for an acceptance, as for instance an invitation to a tea, the guest sends her card at the time specified if she cannot attend. It is not necessary to write "regrets" on the card. However, many times, even in the case of a tea, it is helpful for the hostess to know that a guest is not coming. Therefore in such events regrets, though not required, are most thoughtful and courteous.

A less formal invitation is that extended by telephone. This kind, too, should be well worded and given in a pleasing and courteous manner.

Tuesday, April 9
Dessert Bridge at 7 o'clock

Mrs. John Smith

R.S.V.P. 1400 Poyntz Ave.

To meet
Miss Mary Gray

Mrs. John Smith

Tea, Tuesday, April 9
4-6 o'clock

Fig. 182

Visiting cards are often used for invitations

Happy to accept!

Miss Mary Gray

Tuesday, April 9
Dessert Bridge at 7 o'clock

Fig. 183

Visiting cards are also used for replies to invitations.

The acceptance or regret usually comes immediately, which often is an advantage to the hostess.

Arrival of guests

Guests for meals should be prompt. They are expected to arrive from five to ten minutes before the hour set in the invitation. This permits them to greet the host and hostess and one another. The hostess need not wait more than fifteen minutes for a belated guest. If one is prevented by circumstances beyond control from being on time, he should take his place at the table quietly, with a word of apology to the hostess. If the guest is a woman, both host and hostess rise to greet her, but, if a man, the hostess remains seated. A tardy guest should ask to begin with the course then being served.

REFERENCES

Agan, Tessie, *The House.* Chicago: J. B. Lippincott Co., 1947.

American Heart Association, *The Heart of the Home.* New York, 1948.

Beyer, Glen H., editor, *The Cornell Kitchen.* Ithaca: College of Home Economics, Cornell University, 1952.

Department of Foods and Nutrition, Kansas State College, *Practical Cookery.* New York: John Wiley and Sons, Inc., 1956.

Fahsbender, Myrtle, *Residential Lighting.* New York: D. Van Nostrand Company, 1947.

Fisher, M. K. F., *Here Let Us Feast.* New York: The Viking Press, 1946.

Gilbreth, Lillian M., Orpha Mae Thomas, Eleanor Clymer, *Management in the Home.* New York: Dodd and Mead Company, 1955.

Hawkins, R. R., *The Kitchen Book of Planning and Remodeling.* New York: D. Van Nostrand Company, 1953.

Schlesinger, Arthur M., *Learning How to Behave.* New York: The Macmillan Company, 1947.

Vanderbilt, Amy, *Complete Book of Etiquette.* Garden City, New York: Doubleday and Co., 1954.

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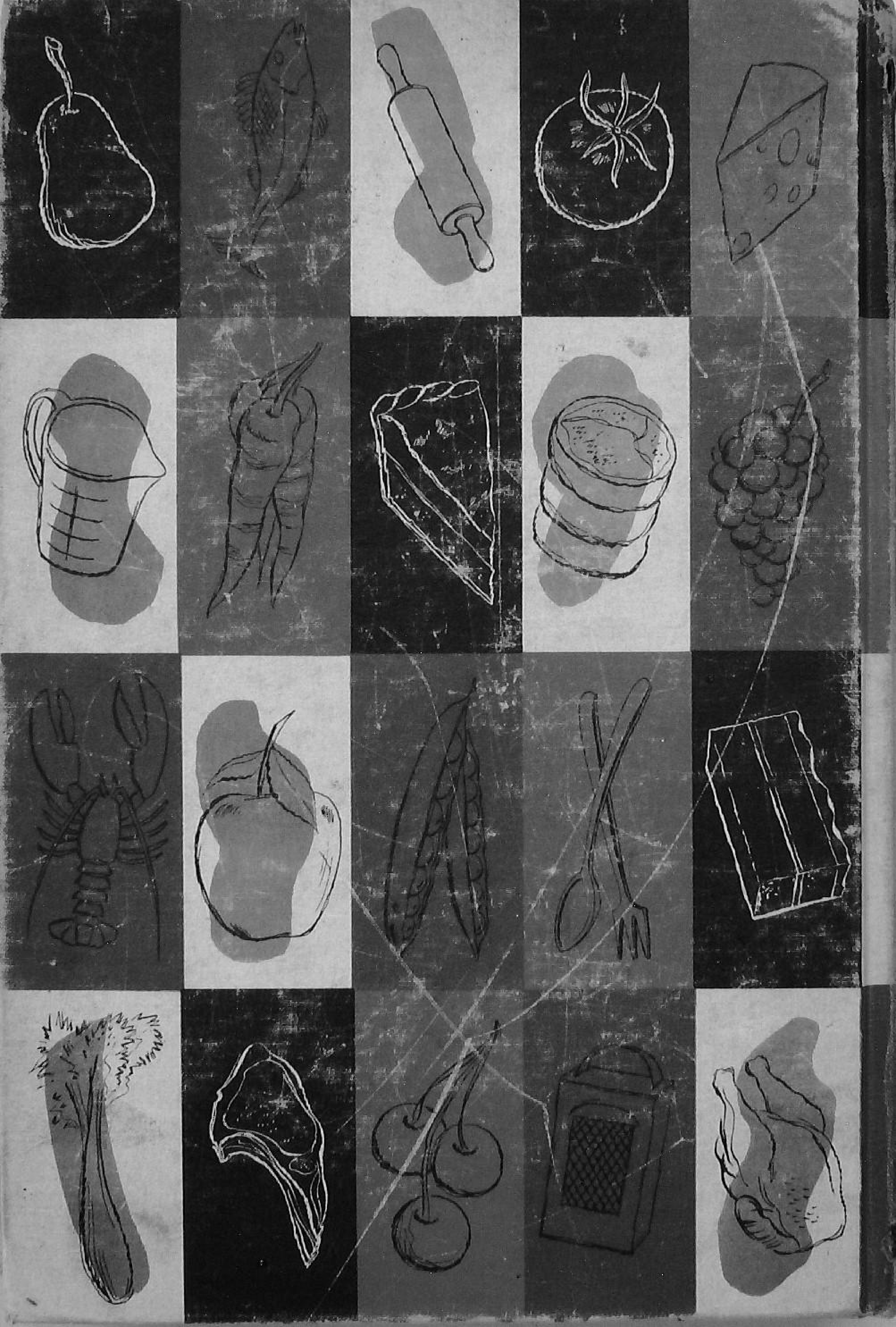
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